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OUR NEXT ISSUE

The March number of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION again will be dedicated to the interests of those who must plan and equip America's school shops. This special issue known as Bruce's School Shop Annual will bring to its readers shop layouts, equipment lists, course outlines, hints on shop management, and other helpful material for those engaged in industrial arts and vocational education.

THIS MONTH'S COVER

Benjamin Franklin was such an outstanding figure in so many lines of human endeavor that his picture has been chosen for this month's cover of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

Printing instructors will be especially pleased that this was done, because, through their National Graphic Arts Education Guild, they have dedicated the week, January 15–20, which includes Franklin's birthday, as Printing Education Week. They are also endeavoring to have Franklin's birthday, January 17, declared a national holiday.

ANOTHER TRANSPARENTIZER

We have been advised by the A. B. Dick Co., 720 W. Jackson Blvd., Chicago, Ill., that Mimeograph Translucent Oil No. 1446 is an excellent material for transparentizing drawing paper for blueprinting purposes.

See also Grant M. Paterson's article on "A Good Transparentizer" on page 70 of this issue.

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The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Phillippine Education Co., Manila, P. I.

W-110 SHAPER

The best shaper is none too good for your shop . . . and the best in its field, of course, is the Yates-American W-110 which has been a pacemaker ever since its introduction.

It is a rugged, precision-built, ball bearing machine having many features found only on industrial type shapers. The most outstanding of these is the flat fabric belt drive—similar to that which has proven so successful on our high speed production routers and shapers. Friction, noise and vibration are reduced remarkably. Completely enclosed for greater safety.

The fence is easily adjustable and highly efficient. *Both* faces can be adjusted to and from the cutter. The nickel-alloy, cast-iron table is ground to an exceedingly smooth finish and needs no "breaking in".

The W-110 Shaper is especially valuable for school use because it has an extremely wide range of uses. In addition to the more common shaping operations, it can be used for running moulding, for rabbetting, making stub tenons and for making dado, rabbetted, mitre and spline joints.

An exclusive feature with Yates-American is the tilting table which is available on the W-110 Shaper as extra equipment. It enables you to cut bevels and intricate mouldings with standard shaper knives, and is especially useful on fine mitre work. The table tilts 45° and is hinged at the working surface —there is no gap at any angle. An outside holdover fence and a spring-loaded chipbreaker are also available as extra equipment. Write for a new circular which fully describes this machine. There is no obligation.

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

This is the fourteenth of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. We will welcome your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

SHORT TALKS ON WOOD

BLACK CHERRY (*Prunus serotina*)

Most important of the native cherries, this is the commercial tree which grows in forests, and should not be confused with the cultivated fruit tree. The wood is light, strong, close-grained and moderately hard. Not liable to warp or shrink. Heartwood is reddish-brown. Has a beautiful, satiny lustre and is easily polished. Yellowish sapwood.

Highly prized for interior finish, furniture and cabinet work. Used for tool and implement handles. Is exceptionally well suited for patterns and photo-engraver's blocks. Relatively scarce and expensive. Bark and fruit possess valuable medicinal properties.

Grows from Nova Scotia south to Florida and west to Kansas and Texas. Rich bottomlands and moist hillsides are its favorite home. Rapid growing. Hardy.

A medium-sized tree, 30-50 feet high with a trunk diameter of 6-20 inches. Main branches are few, bulky and irregular, forming an open oblong crown. Forest grown trees have long clear trunks.

The bark on young trees is reddish-brown, smooth and lustrous. On older trees it is darker and broken into small, irregular plates. The leaves are simple, alternate, 2 to 5 inches long, finely toothed along margin, somewhat leathery in texture, dark green and shiny on upper surface, paler beneath. The fruit is dark purple or almost black when ripe, globular in shape, about the size of a pea and is borne in long hanging clusters. Edible, although slightly bitter in taste.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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Things to Come in Education

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Studying the past and the present to foretell the future.

Rex Putnam, superintendent of public instruction for the State of Oregon, recently defined a *trend* as a *long-time* "swing to one side or another of what is at the moment considered the 'normal' pattern." It is well to remember also that the *normal* is constantly changing, the more noticeable changes coming from day to day by means of *short-time* discrepancies. If these short-time, momentary changes be averaged, I suppose one would arrive at the normal. By observing the gradual long-time swing of the normal one should be able to detect a *trend*. Based upon these long-time changes or trends, so far as it has been my opportunity to observe them, I venture some predictions of future developments in secondary education.

Integration in the Secondary Schools

One of the trends in recent years — so strong as to be almost a fad — has been the increasing emphasis upon *integration*, the *integrative curriculum, educating the "whole" child*. Perhaps this trend has, more than anything else, resulted from an earlier overemphasis of departmentalization. Since the inception of the junior-high-school program there has been a strong tendency toward departmentalizing many fractions of the curriculum of secondary education, until within recent years teachers have too often ceased to think of the relationship of *their particular parts* of the secondary-school program *to other equally valid and nonetheless important phases* of the *same* program. Result? Educational administrators and *professional* educators — especially that rare specimen of the professorial type who ferrets out the ills of the secondary-school program from the vantage point of a swivel chair in a college classroom — were quick to realize the weakness of such a highly dismembered program. *Integration* has been shouted from the housetops in an effort to make teachers and laymen alike conscious of the need for tying together all loose ends and working toward the common goal of a well-rounded educational program suited to the needs of youth of secondary-school age. *Correlation* is the older term for it, but we seemingly have worked up a great deal of steam about something which is paraded as new. The pendulum swings definitely toward the left, carried along by our enthusiasm over new nomenclature, and the move is on to *integrate* everything.

The Complete Learning Process

To integrate means to bring together the parts; to make whole. *That* is the process which the educators would have us perform. But before the *parts* can be put together intelligently there must be some understanding of those parts. Differentiation precedes integration. Before children are at the *curious age* they are satisfied to examine the *whole* of an object. Soon they want to *take it apart*, to see how it works, to examine it in more minute detail. Some are able to integrate the objects afterward and some are not, but surely the complete learning process embraces: (1) *viewing the whole* in all its completeness, gaining a fair impression of *relationships* in the process; (2) dismembering, examining, *analyzing the several parts* and processes in an effort to learn the details of its whys and wherefores; and (3) *integrating* all of that knowledge by a more mature consideration of the whole mechanism or object, movement or philosophy, creed or ism, in the light of both the *general* and the *specific* information gained by such procedure. There are at least three broad phases of the learning process: (1) Establish a general background of information about the problem at hand, to develop appreciations, and to chart the way for further study. (2) Impart specific knowledge to that degree and in whatever detail the previously established information will justify and sustain. This is differentiation. (3) Consolidate, correlate, integrate the information, the facts, procedures, and processes, analyzing and comparing the *parts* to form a better impression of the *whole* structure.

The Integrated Curriculum

Froebel, the German educator of the early nineteenth century, called these three phases of the learning process: (1) random experimentation, (2) instruction, (3) creative effort. Whatever the name or term used, *the function of the first* at any level of education is to build a *background* of information, to develop an understanding and an appreciation, out of which there will come a *feeling of need* for further study — for *instruction* in more detail. Then and only then should instruction follow in detail. At that point *differentiation* begins. *Integration* comes later. By Froebel it was aptly called creative effort.

Turning now toward the future, it seems to me that the present movement toward an *integrative curriculum* will resolve itself into a program about as follows:

1. *Integration as a fad*, after much trial and error, will give way to departmentalized procedure organized almost as at present but with considerably more thought on desirable *outcomes* and proper *relationships*. In addition, there will be a much closer *correlation* of the various subject-matter groups than heretofore. Each teacher will be more conscious of his or her part in the whole scheme of education. Each teacher will work consciously toward the re-enforcing of the work of each other teacher. There will be a stronger effort to present the pupils with a broader picture of life's activities and with an educational program necessary for the survival of a great democracy. *Integration will become a process*, really functional, rather than a catch phrase to confuse the public and to parade one's up-to-dateness before the educationally elite.

2. *In the elementary schools*, where at least the essence of correlation and integration have been the practice for years, and yet where *some* departmentalization has flourished in the study of particular activities, we shall probably see still further improvement centered about a *directed activity* program in which the practical-arts subjects (homemaking, agriculture, industry, commerce), with science and the social studies closely correlated thereto, will become an active *core* through which the "three R's" will be vitalized. The practical-arts activities of these early years should be realistic, never truly departmentalized except perhaps in the upper reaches of the elementary school, and then only in a minor way. They (the practical arts)

should be treated as media of visualization and expression rather than as technical ends in themselves. To the children they should be *experiences in real life.*

3. *In the junior high schools,* where departmentalization has somewhat overrun itself, there must be a conscious effort on the part of teachers to carry out the idea of integration in its best form. Personally I like the term *correlation,* although *integration* contributes an ideal not included in the older term. Correlation, where present, need not be in *time,* perhaps can seldom be, but certainly there should be some attempt at correlation in the *application* of subject matter, each teacher re-enforcing the efforts of each other teacher.

Also, in the junior high school, there should be the beginning of a semitechnical education, continuing the realistic practical-arts core of the grades but substituting more direction, more departmentalization, than in the earlier program. Integration should not be lost, but the groundwork should be laid for the development of special interests and aptitudes. *The activities should be of an exploratory-technical nature* and must necessarily maintain their identity. A satisfactory program can never be developed by submerging the practical-arts subjects to a position of mere *busy-work* application in an integrated procedure of doubtful merit. Teachers for the junior high schools should receive a more highly specialized training than do those for the elementary schools, each within his or her preferred field or fields. In addition to the specialized training, each teacher in the junior high school should know the objectives of both the elementary and the senior high schools, should be informed on and sympathetic with the principles, objectives, and techniques of guidance, and should be able to render some degree of *effective social orientation.*

4. *In the senior high schools* of the future, there will be less emphasis on specialization than heretofore, at least until such time as there is a definite change in the organization of the senior high school itself. We shall come to this change a bit later. Nevertheless, in the senior high school, there will be the *beginning* of specialization, and a continuation of departmentalized procedure, with *more* emphasis upon *social orientation* than heretofore.

The general aim will be *differentiation* in the special fields and *integration* in the social subjects. Here, the social-economic group should become the integrative core, but ample provision will be made for the continuation of the practical-arts subjects and for the *beginning* of vocational preparation. Some degree of specialization should be provided in the sciences, the arts and crafts, homemaking, agriculture, commercial subjects, and in the significant basic industrial occupations. For those not contemplating college, vocational preparation should be intentional and intensive, at least in the last year or two.

Teacher education for the senior high school and above should be more highly specialized than for the junior high school. But the departmentalized organization of both the high school and the teacher-education center should not overlook an even greater necessity at the high-school level for an *effective* program of *social orientation and social control.* To that end *every* teacher, however highly specialized in his own subject-matter field, should be trained for functional service as an adviser and leader. Student self-government will furnish a laboratory for active participation, but *every teacher a leader* will help to give the *integration* necessary to success in the social program.

5. *The junior college,* now flourishing in some states and making progress in others, seems to be due for a radical change. To my mind, the junior college is the greatest misfit in our present educational program. Organized for the purpose of decreasing the cost of college education by keeping young people at home two years longer, these schools have, almost without exception, developed a classical type of program well suited for entrance into the liberal-arts colleges but poorly suited to the needs of a student who will enter some field of higher technical education — engineering, agriculture, forestry, medicine, etc. — and entirely without value to those who will later enter vocational employment of a lower order.

It is almost a universal experience that a student transferring from the average junior college usually has three years of work ahead of him before he can complete a technical curriculum normally requiring a total of four years preparation. In that respect the junior college has succeeded in keeping him at home two years longer, but in so doing has prolonged his higher education program to five years instead of four. This is inevitable because, for the number of students involved at a given school, the junior colleges cannot set up in the several technical fields the required subject-matter courses normally a part of the early years of the respective technical curriculums. It is also impossible for the student, when he transfers to a technical college curriculum, to maintain a *balanced* schedule of studies at full-load value. With a large proportion of his general or academic subjects completed and with too large a remaining proportion of technical requirements to be crowded into the remaining two years of college work, an additional year is the usual result.

The Six-Four-Four Plan of Organization

In referring to the senior high school a promise was made to discuss later a probable reorganization of that school. That promise is now before us. The change affects the junior high school and the junior college as well.

There seems to be a well-defined trend, not yet noticeable in any great measure but nevertheless evident in certain quarters, toward a reorganization of the field of secondary education on the 6-4-4 plan. Let us compare this with the present organization on the 6-3-3 plan for the elementary, junior-high, and senior-high programs. Under the 6-4-4 plan of organization, the elementary school would remain practically as at present; the junior high would be extended one year, to take in what is now referred to as the tenth grade; the senior high school would be extended to include the junior college years, that is the 13th and 14th grades.

It should be noted that the writer has *not* said the senior high school would include the junior college as now organized. There will be a real effort to overcome the weakness of the junior college; namely, its inability to care for the life needs of students other than those entering the liberal-arts colleges.

To understand the trend toward the 6-4-4 plan one must not lose sight of the delayed age of employment and the higher demands placed upon both the technical student and the vocationally trained. Let us also recall that, coincident with the delayed age of employment, it is quite generally agreed there is no place for narrow specialization prior to the twelfth grade. It then becomes evident that the upper secondary level of the 6-4-4 plan will render a double service — *college preparation* for those who wish college education, and *basic vocational preparation* for those who will not go on to college. In each instance *the last two years of the upper secondary school,* because of the larger number of students served under a single co-ordinated administration, *will provide opportunities for a higher degree of specialization* than is now available in either the senior high school or the junior college, all of which will proceed from a broader background than heretofore.

If and when such a plan of organization takes effect, the new four-year junior high school would provide time to do better that which has been reasonably well accomplished in the present junior-high-school program. More emphasis on social orientation will be possible, and there will be a broader base for emphasis on the exploratory-technical backgrounds necessary to a well-rounded program of educational and vocational guidance at the junior-high-school level. With the proper preparation of teachers for the *lower secondary* level (the new four-year junior high school) considerably greater progress can be made in guidance and social orientation, each so important to the development of adolescent youth in this scientific and industrial era.

The *upper secondary* level (the 11th, 12th, 13th, and 14th school years) would afford a materially better opportunity for a unified or co-ordinated program, catering to the 90 per cent who do not go to college, as well as to the 10 per cent who do, in a very much more adequate manner than the present three-year senior high school and the junior college can hope to do as separate units. For one thing, the new organization would provide four years of co-ordinated work under a single administration and without a break in objectives. For another, there would be less division in the

student body, more continuity of purpose, and greater economy of organization within the various areas of specialization. Both the college-preparatory and the vocational-training programs would benefit by such an adjustment.

Enriched Practical-Arts Programs

Several of the indices used to detect trends in education point to a gradual increase in the practical-arts subjects, and to the increased regard with which these subjects will be held in the reorganization of the program under both the present 6-3-3 plan and the future 6-4-4 plan. For example, there are in several quarters constantly increasing discussions of the practical arts as a *core* about which to center the attention of students in the development of an integrative curriculum. When first launched as a movement, the proponents of the integrative curriculum turned almost universally to English and the social studies as a core. The pendulum of opinion seems now to be swinging toward the inclusion of the practical-arts subjects in the core area. There is apparently a realization that pupils will respond more naturally to the practical-arts activities, which represent real life situations, than to an artificial core based upon the conventionalities of speech and social behavior. Then, too, the practical-arts core subjects — homemaking, industry, agriculture, commerce, and the applied arts — touch upon practically all phases of man's activities and furnish a rich opportunity for the functional use of the languages, mathematics, the sciences, educational and vocational guidance, and the social arts. The practical-arts subjects must not — will not — lose their identity in the scrambled hodgepodge that is sometimes conceived as integration.

Visual-Instruction Methods

Everyone is aware of the rapid progress toward visual instruction. There have been great improvements in the various media for visual instruction, from improved illustrations in texts and reference materials to the development of the talking motion picture designed specifically for teaching service. Time was when *visual instruction* was applied principally to the use of lantern slides or the stereoscope. Nowadays there are many other media available, most of which are well within the reach of even the smallest schools and the poorest teachers. Some of these visual-education devices can be produced by the teacher himself, even though he may not have a professional laboratory at his disposal. The production of the talking motion picture is, of course, beyond the average teacher, or even the most progressive unless the proper equipment is available. But the films of recognized departments of visual instruction are available to all schools at a reasonable cost.

In passing, two types of motion-picture films may be mentioned, either of which may be secured in the silent version or the sound-on-film variety, in a great number of subject-matter fields, covering a wide variety of topics. These two types of films, for the want of better titles, will be referred to as: (*a*) *background* and general information; (*b*) *teaching films* covering specific subject matter.

The *background* films are available in considerably greater numbers than are those designed for direct instruction. These background films, some of which are available from manufacturers and industrial concerns, others from departments of visual instruction, serve to stimulate and broaden the educational horizon. They may be used at widely divergent times, rather than being required at a specific point in the classwork of a given subject.

The *teaching* films are much more intimately related to the course of study for a particular subject and usually require a scheduled showing close to the specific point of application. While these are not available in great numbers at present, the film libraries are providing them in increasing numbers, particularly in the fields of science and industry. Other fields will undoubtedly be developed as the demand justifies.

Professional Advancement of Teachers

For teachers, competition is increasing, particularly noticeable in the increasing certification requirements. In response to the requirements, and in their quest for professional development, teachers are turning to institutions of higher education, seeking higher degrees, and demanding an opportunity to present graduate majors in fields in which, only a few years ago, graduate study was thought to be unnecessary. Such is the case in all of the practical-arts subjects.

With the increasing demand for practical-arts teachers, and too often with certification requirements which do not demand specific preparation in a given practical-arts area in order to teach in that area, there has come a tendency toward *chiseling*. Teachers trained in other areas, principally in the academic subjects, finding an oversupply in their particular fields, have turned to the practical-arts subjects as an outlet for their energies, sometimes without as much as a *minimum* of preparation in these subjects. So long as certificates to teach are granted upon the completion of certain stipulated courses in education and a specified number of college credits of undergraduate and graduate nature, without reference to *what* one is qualified to teach by way of subject-matter training, chiseling will be in order. Chiseling becomes more attractive to the chiselers when, because of a shortage of trained practical-arts teachers the salaries for these subjects are more attractive than for the academic subjects.

The training of an adequate supply of workers in any field usually presents problems difficult in two respects:

1. Who shall determine the adequacy of training?
2. How shall the number of trainees be regulated to present a reasonable guarantee of adequacy without an oversupply?

Neither of these points is easily answered. The problem is the more complicated in areas of training involving a major investment on the part of both society and the trainee. One hesitates to spend from four to seven years in preparation for a profession when the only prospect of placement may be based upon the whims of chance. Likewise, society hesitates to set up the necessary facilities for training when those facilities are inherently expensive, and particularly if in so doing there might be a needless duplication of effort in turning out more trainees than are needed.

Perhaps an illustration will be the best means of making this point. Some years ago the American Medical Association, faced with problems almost identical with those stated above, undertook to:

1. Determine what constituted an adequate medical training, and set standards accordingly.
2. Exercise a measure of control over the certification of doctors of whatever sort, working through the various state certificating agencies.
3. Place upon the approved list *only* those medical schools maintaining adequate staffs and facilities to guarantee *professional* training of a high order.
4. Limit the number of schools and the number of medical students in keeping with the number of physicians and surgeons of whatever type required for adequate medical service to the nation.

Under such a plan medical schools have been standardized, the output of those schools has been professionalized, and the whole medical association has been upgraded. The public has benefited by the elimination of weak schools and by the saving that has accrued in the elimination of duplication.

More recently, the nationally organized Engineering Council for Professional Development has instituted a similar procedure for the training of engineering students. Still more recently, in November, 1938, the American Association of State Universities and the American Land-Grant College Association have expressed disfavor toward such professional regulation and have created a joint committee for the "control of the rapidly multiplying accrediting agencies for various types of academic work." We see, therefore, an attempt at self-regulation and standardization by certain professional groups rendering service important to the nation, and an equally vigorous resistance, at least in the making, by the institutions of higher education responsible for the training of the new members of those same groups. The question comes, if professional groups cannot set their own standards without running counter to the interests of the institutions furnishing the training, will or can those professional groups do *anything* to uphold and perpetuate professional standards? Or should they?

These thoughts on professional development for teachers are submitted for whatever they may be worth. They should be particularly provocative to teachers of the practical-arts subjects because few states have set up certification standards adequate for the professional guidance of teachers in the practical-arts area. There is little or no protection from the inadequately trained teacher who would gladly chisel in at the invitation of an equally uninformed superintendent or principal. In the meantime it behooves each teacher, of any subject whatever, to be professionally alert, to improve himself in every manner available — by professional reading, contact through professional associations, advanced study in summer sessions, etc. — to keep abreast of current educational trends, not only in his own particular specialty but in the field of education as a whole.

Sometimes we in education, without reference to any particular group, have been guilty of self-admiration, preying upon our neighbors, appropriating unto ourselves that which might have been originated by others, and finally of never being satisfied with what we have. Some of these traits are admirable. Some should be suppressed. Striving for more is admirable only to the extent that we know specifically what we want, have well-founded professional objectives and reasons for wanting it, and keep true to a professional course, gaining our objectives through ethical means only.

Industrial Arts and Vocational Education in the Modern School

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Steps to be taken to make general education more fruitful in preparing youth for life.

From many sources come suggestions that the major problems of public education in the United States will not be solved without making a rather thorough reorganization of our secondary-school system. It is not necessary to repeat here the widely quoted figures which show the phenomenal growth in enrollment in the junior and in the senior high school during the past thirty years, nor to tell again the story of how the task of the public high school has been radically altered by changes in the economic and social status and future outlook of the young people who seek its services.

What are the functions of modern education? It is twofold in character: First, to provide all future citizens a general educational background; and secondly, to provide occupational training. General education refers to all activities which do not have relationship to any specific field of service. Occupational education is interpreted to include all activities directed by the school for preparing the individual for specific fields of service.

It is obvious that general education today is not the same as it was a generation ago. All of the talk about returning to the fundamentals of education, i.e., the three R's, is a result of loose thinking. We cannot return to 1910 schools; youth today faces a 1939 civilization with entirely new situations confronting them. What, then, are some of the problems of general education? A specific one is that no one yet knows the kind of training which is necessary in this constantly changing society. Judd[1] declares, "The only sure formulae which can be adopted by educators is one that emphasizes the importance of cultivating adaptability to the highest degree. If the individuals can be prepared to adjust themselves to new situations, they will be far better equipped for the future than they will be if they are taught by the long-established traditional formulae." Hence, our general education must prepare youth for contemporary social, cultural, moral, civic, political, economic, and industrial life. Just how long general education, as provided by the schools, should continue is difficult to answer. We are convinced that it must continue a much longer period than it did even a decade ago. A short time ago Briggs gave as one of the objectives for the junior high school, "To continue, insofar as it may seem wise and possible, and in a gradually lessening degree, common integrating education." That same objective can be well applied to the senior high school of today. In fact, already there is a decided need and justification for this philosophy of general education to continue through high-school graduation. However, before going farther it might be well to point out, that since educational facilities above the high-school level are available to only a small percentage of our boys and girls, it would be unwise at this time to eliminate vocational education from the secondary school.

It may be said that education, general if you like, should change the individual in three respects; namely, by developing his attitudes, habits, and traits (character); by developing his knowledge of subject-matter information; and by developing manipulative skill in the usage of the tools placed at his disposal. Although it is generally recognized that one's attitudes, habits, and traits are important factors contributing to success, the schools have given little attention to their development. Numerous studies have verified that factual materials are easily forgotten when not used frequently, while character traits, if properly acquired, are relatively permanent. Studies show that many more people, including teachers, fail in life because of the lack of proper attitudes, habits, and traits than because of the lack of ability to do the work. Yet, in spite of the concrete evidence presented us, the traditional school continues to emphasize factual material to the neglect of developing desirable character traits.

The second change that education must bring about within the individual is to develop his knowledge of subject-matter information. Although we shall admit that knowledge or facts alone are not ends in themselves, yet we must acknowledge that they are tools with which the human mind works. That is to say, our course of action is quite often determined by the facts in our possession. For example, if one knows that certain industrial products are good or bad, useful or nonuseful, costly or inexpensive, his decision to make a certain purchase is guided accordingly. This we commonly call consumer education. Certainly in this day of the ever-increasing array of industrial products placed at our disposal, the average citizen is befuddled unless he possesses much consumer information. If not in the schools, where is he to get honest, unbiased knowledge about industrial products? This may well be a part of our general education program.

Lastly, general education must provide all individuals with a degree of manipulative dexterity that will enable them to be at least partially self-reliant. The day of helplessness on the part of anyone, including women, in manipulating mechanical contrivances is past. Today, some women possess more handy-man abilities than some men; consequently, they no longer are the helpless creatures mechanically, who must always depend in part on man and his dexterity. What are a few of the manipulative skills which should be possessed by most people? One might mention operating an automobile, operating the many electrical contrivances in the home, typewriting, hanging a picture. Yet, one is frequently surprised at the number of men and women who are unable to do, even reasonably well, the simple manipulative operations enumerated in the preceding statement. If we are to have a citizenship prepared to use intelligently the products of our present industrial society, the schools must train its pupils for this life. In other words, this

[1] Judd, Chas. H., "What Is General Education," *Industrial Education Magazine*, November, 1937, pp. 225–332.

training must become a part of our general education program.

Perhaps it is time to raise the question: Can industrial-arts education make a contribution to this general education program? Very few high-school subjects have the unique possibility of contributing to this threefold development; namely, of desirable habits, traits, and attitudes; of subject-matter information of an industrial nature; and of manipulative skill in handling industrial tools and machines, as does the subject of industrial arts. It must be remembered that a larger percentage of our population is engaged in industrial pursuits than in any other occupational group including that of agriculture. Since so many individuals are engaged in industry, is it not logical that a study of industry, its products, and its workers form an important part of our high-school curriculums? It certainly cannot be refuted that a vast number of our present-day problems are an outgrowth of the industrialization of our country. Our traditional education has ignored or refused to give industrial arts more than secondary importance in the course of study, but a brighter day is dawning. Accrediting agencies are discovering that we are living in a 1940 civilization, and that many of the traditional subjects in the school curriculum must be supplanted by more functional courses.

Our schools should provide youth not only with a good general education but also include courses in vocational education. Although it is true that man does not live by bread alone, yet without food and shelter man's appreciation of the cultural phase of living will likely be strained. Numerous problems confront contemporary vocational education. A list of a few of them follows:

1. The cost of vocational education is often too great for small communities.
2. In small communities there is seldom sufficient interest in any one occupation to justify the expense of establishing classes.
3. Industry does not need young workers.
4. Leaders in the vocational field are not certain as to the age to commence training, to the length of training, and to the exact type of training.

In regard to the first problem, we know that most types of specialized training are expensive. Without adequate equipment, a vocational-education program would be a mockery. Equipment is highly expensive. It would not be a misstatement to say that an expenditure of twenty-five thousand dollars would be necessary to provide adequate equipment for establishing a class for approximately twenty individuals in certain occupations. Consequently, to attempt to provide training facilities for even a mere half-dozen occupations would entail a considerable investment. From the foregoing, one can recognize that from the financial viewpoint much vocational education in small communities is not feasible.

Furthermore, it would be difficult to secure sufficient numbers to establish classes of a desired size. There is also the problem of placement. Small local areas could absorb only one or two each year in the representative occupations. To have an oversupply of specialized workers in any one occupation is folly. However, the problems of larger classes and lower per-capita costs could materially be reduced by having few and large vocational schools strategically located over each state. Naturally, this plan raises the problem of support. Certainly the support could not be a local one, but instead it would have to be state or federal or both.

Thirdly, the problem of vocational education mentioned in a preceding paragraph is that no longer does industry need young workers, nor moreover, does it want them. They are too much of a liability. Accidents are more numerous among very young workers. Besides having no family responsibilities, they shift from one job to another ever seeking greener pastures. Such a practice is costly to both society and to business. Therefore, industry is fast becoming disinterested in youth as workers.

We now come to our last problem, that of determining the age of entering the training period, duration of this training term, and type of training to be provided. Fundamentally, there appears to be a uniform agreement among authorities in the field that the period of training should be just prior to entrance in the chosen work. Since industry has increasingly indicated that it does not want workers before the ages of twenty or twenty-one, it naturally follows that vocational training may well commence directly after high-school graduation. Entrance then into a vocational school for a period of two or three years would provide these requisites. Such a plan would enable the individual to reach a degree of maturity before it was necessary to make the final choice of his livelihood. This also would be most compatible with the proposition previously advanced that the period of general education in our society should continue until high-school graduation.

As to the length of the training period in the occupational field, it is generally agreed that this varies as to both the type of occupation and the intensity of the training program. As to the type of training to be provided, it is for the most part conceded that too much specialization in any one occupation is unwise. Changes in industry can easily render overnight one specific job useless. Directors of vocational programs are now urging a more general training in order to make possible the entrance into a number of related occupations. On this point Superintendent Johnson of the Chicago schools says, "We have no intention of training young persons for any specific jobs in industry. That's industry's job. Our job is to give them general training, so, for example, a boy can be turned out as an all-around machinist." Such a plan would make possible for the boy's entrance into any one of a related group of occupations offering employment at the time of graduation. Later, at a more opportune time, he could shift to the specific field of service in which he was interested. To a large degree, this would eliminate drifting while waiting for a highly specialized job to open. Studies have verified that if an individual is unable to enter his chosen occupation directly after his training, he seldom gets into it. This represents a waste both in energy and in money.

A few critics of vocational education may say that vocational schools located in carefully selected centers cannot succeed. They point out that many boys and girls who desire and deserve this type of training do not have the financial means to enter and remain in any school not located in their home community. In answering this criticism, may it be pointed out that the need for skilled workers on a subprofessional level is so great that it would be justifiable for society to pay all costs pertaining to instruction, room, and board for those selected to receive this training. At first, such a proposal seems startling. But does not society deem it desirable to gather incorrigible boys and girls and place them into state institutions which provide them room, board, clothing, education, and training in some specific occupation? If society can do this for those of doubtful outcome, surely it is more justified in doing the same for those young citizens who are more promising. It is a well-known fact that it is cheaper to keep an individual in an educational institution, including room and board, than to keep him in state penal institutions. For a considerable time, America has given so little attention to the training of skilled workers that we are now facing a tremendous shortage of them. In fact, this shortage is so acute that radical practices may have to be adopted in order to encourage young men and women to prepare for occupations requiring manipulative dexterity. In addition, society will have to develop a higher regard for its skilled workers than it has held in years past. This new attitude must be adopted or there will be further labor chaos and unemployment.

Summary

From the foregoing, it is quite plain that general education is rapidly changing. The period of general integrating education is constantly being lengthened. Thus, vocational education may commence at a later date, that is, about two or three years before entrance into gainful employment. The present problems of vocational education are many, a prominent one being the method of providing this training to boys and girls in small communities and in remote districts. In the past, small classes and high costs have made this training almost prohibitive except in large cities. One solution to this problem may be state or federal subsidization of a limited number of vocational schools to the extent of supplying the student room and board or part-time work during the training period.

These problems of general and vocational education can be solved only by a change in our existing philosophy of education followed by a reorganization of curriculums and the administrative control of the schools.

Student Elimination Versus School Records

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Abstract of a study submitted in partial fulfillment of the requirements of the doctoral degree at Colorado State College, Greeley, Colorado.

While it is true that the secondary-school population has increased approximately 3,000 per cent within the past half century, yet selectivity is prevalent in public secondary schools.

Since the total enrollment in the secondary schools of America is increasing rapidly, it might be assumed that these schools are functioning to perfection and that selective factors no longer affecting the enrollment in this level of education are:

1. Any factor that *encourages* pupils to attend the high school is called a selective factor of secondary education.

2. In the same way any factor is considered a selective factor of secondary education if it tends to *discourage* pupils from attending the high school, thus forcing a change in the high-school enrollment.

Knowledge of the factors that encourage students to attend school is important, yet it is evident that these factors are not magnetic enough to attract and hold 100 per cent of all students who should be enrolled in the secondary schools. The emphasis of study should be placed on those factors which tend to eliminate students from the secondary schools.

The existence of selective factors of secondary education can be determined rather directly by a conscientious study of the students' school records. Such factors, usually found included in the school records, are those described by Feingold,[1] Haggerty,[2] Holley,[3] Portenier,[4] Payne,[5] Counts,[6] Goldbach,[7] Rutledge,[8] Prunty,[9] Cobb,[10] Wilson,[11] O'Brien,[12] Book,[13] in their studies of pupil elimination. Those factors are:

a) The social and economic status of the pupils, as determined by paternal occupations and home zoning.
b) The mental age norms of the pupils.
c) The sex of the pupils.
d) Commuting time.
e) Scholastic achievement, as determined by teachers' marks.
f) Curriculum choice.
g) Subject failures.
h) Retardation.
i) Family size.
j) Education of parents.
k) Occupational choice.
l) Persistency in school.

A recent study of the school records in a city school system revealed that 44.7 per cent of the pupils enrolled in the seventh grade in 1929–30 were eliminated before the end of the twelfth grade. This change in enrollment, resulting from the elimination of pupils in the six years of secondary school, presents the question: What are some of the general causes for and trends in the change in enrollment of pupils from the secondary schools? A study was made to attempt to determine the trends of enrollment change resulting from pupil elimination. In making the study a true cross section of the enrollment of the seventh grades of 1929–30, of the school system, represented the population of the study. Three of the Junior high schools in the city were selected to represent the composite enrollment of the eight schools offering junior-high-school work. The original population of this study was 971 pupils, or 43.2 per cent of the total enrollment of the entire seventh grade in the school system in that year.

The items of data to be secured were determined by a study of previous pertinent research reports. Three sets of school records were used as sources for providing these items of data. Those sources were: the junior-high-school record cards, the high-school record folder, and the attendance and guidance record cards. These three sources provided sufficient data for the study.

The data were presented for study and comparison using three groupings of the population of the study, the composite group consisting of 891 pupils enrolled in the seventh grade of three junior high schools in 1929–30, the continuation group consisting of the 323 pupils who remained in the high schools until the completion of the twelfth grade, and the elimination group consisting of the 568 pupils of the composite group who were eliminated during the six school years, 1929–30 to 1934–35.

The general causes for and trends in the change in enrollment of pupils from the high schools may be summarized as follows:

A direct relationship was shown between the average times the family migrated and the elimination of the son or daughter from school. It was evident that the pupils who were more persistent in school continuation changed communities fewer times, on the average than those eliminated from school.

The data justified the conclusion that a pupil's tendency to remain in school is directly related to his mental age. The groups who continued in high school the full six years are superior in mental age to the pupils eliminated. The trends have been to eliminate those with low mental age scores in the high schools.

From the study of social and economic status, as determined by home zoning, it may be concluded that persistency in school continuation favors the pupils from the home zones classed as average or above. The trend during the six-year period was to eliminate the pupils who lived in home zones below average.

The data showed that the trend toward elimination was greater among the groups of pupils selecting science, mathematics, or manual arts as major curriculums.

A study of the success of pupils in school subjects revealed that the pupils eliminated made a lower average grade than did the pupils of the composite group. The trend of enrollment change was to eliminate a large proportion of the pupils making only average grades or below.

There was a relationship between student elimination and the average education of the parents. It was evident that the

[1]Feingold, G. A., "Intelligence and Persistency in High School Attendance," *School and Society*, Vol. 18, pp. 443–450 (Oct., 1923).

[2]Haggerty, M. E., and Nash, H. B., "Mental Capacity of Children and Paternal Occupations," *Journal Educational Psychology*, Vol. 15, pp. 559–572 (1924).

[3]Holley, C. E., *The Relationship Between Persistence in School and Home Conditions*, Fifteenth Yearbook, Part II, National Society for Scientific Study of Education, pp. 9–107, The University of Chicago Press, Chicago, 1916.

[4]Portenier, Lillian G., *Pupils of Low Mentality in High School*, p. 91. Contributions to Education, No. 568, Teachers College, Columbia University, New York, 1933.

[5]Payne, V. F., *The Selective Character of Secondary Education in Nashville*. Unpublished Master's Thesis, George Peabody College for Teachers, Nashville, Tenn., June, 1931.

[6]Counts, G. S., *The Selective Character of American Secondary Education*, Contributions to Education, University of Chicago Press, Chicago, 1922.

[7]Goldbach, R. C., *A Study of the Causes of Transfer and Elimination of Pupils from the Senior High Schools of Cleveland, Ohio*. Unpublished Master's Thesis, George Peabody College for Teachers, Nashville, Tenn., 1930–31.

[8]Rutledge, W. G., *High School Attendance and Vocational Choice*. Unpublished Master's Thesis, George Peabody College for Teachers, Nashville, Tenn., June, 1932.

[9]Prunty, M. C., *A Study of the 1925 Graduates of the High School of Tulsa, Oklahoma*. Unpublished Master's Thesis, University of Chicago, Chicago, 1927.

[10]Cobb, M. V., "The Limits Set to Educational Achievement by Limited Intelligence," *Journal of Educational Psychology*, Vol. 13, pp. 449–464, 546–555 (November, 1922).

[11]Wilson, W. E., *Probable Factors Affecting Elimination in Tennessee High Schools*. Unpublished Master's Thesis, George Peabody College for Teachers, Nashville, Tenn., 1926.

[12]O'Brien, F. P., *The High School Failures*. Contributions to Education, No. 103, p. 34, Teachers College, Columbia University, New York, 1919.

[13]Book, W. F., *The Intelligence of High School Seniors*, The Macmillan Company, New York, 1922.

higher the average education of the parents, the higher the persistency of school continuation for the child.

Pupils eliminated from the high schools are from larger families than are the pupils who continue until the completion of the twelfth grade.

It was evident that the trends in enrollment change were to eliminate the pupils supported by incomes from the unskilled-labor occupational classifications of employment.

It seems that the selective factors of social and economic status, mental age scores, family migration, average paternal education, family size, occupational selection, and curriculum selection were active in the trends of enrollment changes in the high schools. The results of the study of these factors agree with the findings of Counts, Kline, Prunty, Holley, O'Brien, Goldbach, Rutledge, Wilson, Book, Cox, Haggerty, and others in their previous research studies.

The discovery of certain of the selective factors of secondary education which tend to eliminate pupils from the secondary schools should encourage change in the present status of secondary education that will remedy the cause of student elimination wherever the secondary school is at fault. Such change in the secondary school would include the revision of existing courses and the organization of new courses to interest pupils with low mental age norms.

Since the pupils spend a large portion of their time in their selected curriculum, a careful analysis should be made of the existing offering in those curriculums which showed the greatest trend in elimination. The analysis should reveal the possible weaknesses in the curriculum that have caused pupil eliminations.

There is a need for a cooperative plan between the school and industrial, commercial, and transportation enterprises that employ boys and girls of high-school age to permit pupils to work a part of each day and attend school each day. This plan should extend from the seventh grade to the end of the twelfth grade. A plan of this kind would provide an opportunity for the pupils in the lower social and economic status groups to make financial contribution to their family and at the same time continue their schoolwork.

A more carefully organized occupational guidance program should be developed to aid the pupils who will in all probability withdraw from school to choose or prepare for an occupation.

Industrial and vocational teachers can make great contributions in overcoming pupil eliminations from the secondary schools of America. Such additional educational service as the co-ordinated diversified and distributive programs, increasing the application of the general industrial and general shop philosophy and evaluating the outcomes of such programs in relation to the adjustment of maladjusted apprenticeship movements, utilizing mechanical aptitude and other types of tests valuable in placing students in industrial and vocational shopwork and in properly selected occupations, and holding guidance clinics for personal discussions with youth on their individual problems of maladjustment in occupational needs, are suggested.

In general, the school records mean little to most teachers and administrators in secondary schools other than a convenient form of bookkeeping. The greatest service such records can render to a community is in the assistance given in the adjustment of these maladjusted boys and girls who are eliminated from public schools due to, in a large measure, the improper adjustment of the secondary schools to meet their immediate and future educational needs. The selective factors of secondary education are revealed in large measure in the individual student records.

It can be concluded that the information on the school records if properly used will be a vital aid in holding the present groups of pupils in the six years of secondary education.

Factors That Influence Choice of Trade

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A study of the reasons given by 292 vocational students for selecting a trade.

Each year thousands of students entering vocational schools are confronted with the problem of choosing a trade in which to major. Upon what is their choice dependent? What factors, if any, influence their choice most? Of what significance and importance are the factors to the student and to the school?

A study of 292 students in a typical all-day vocational school indicated that the factors which influenced the student's choice of a trade most, were those listed in Table I.

Influence on choice of trade	Number	Per cent
Big money in trade	133	45.54
Can do this work better	127	43.49
Easier than laboring	121	41.43
Parents selected trade	112	38.35
Always get a job with this trade	102	34.93
Knew something about the trade	83	28.42
Friend took trade and made good	42	14.38
Clean trade	18	6.16
Friend is studying trade	14	4.76
Same trade as my father	11	3.76
Graduate told me to take trade	11	3.76

Table I. Analysis of factors influencing trade choices in a typical day-vocational school

Although the figures presented in Table I are self-explanatory, they do not reveal some of the underlying motives that influenced the student in making a given selection. In order to present a more complete picture, the most outstanding of the 11 influences are analyzed to reveal the factors which conditioned the students in their selection of a trade.

Big Money in the Trade

Although this factor, *big money in the trade,* was the most outstanding influence, interviews with the students revealed that they had little or no real evidence concerning the relative wage scales in the various trades taught in the school. About 10 per cent of the students who selected this influence had studied the problem and had sound reasons for their choice.

Occupation	Chemist	Electrician	Mechanical Drafting	Machine Shop	Painter	Sheet Metal	Woodworking	General Shop	Total
Baker				1		1			2
Barber		1			1				2
Bartender				1	1				2
Blacksmith				1	2	1			4
Boilermaker				1	1	1			3
Cabinetmaker				1					1
Carpenter		2	2	2	1	2	3	2	14
Chemist					1				1
Crane operator		1	3			1	1	2	8
Draftsman			1						1
Farmer				1					1
Fireman (lic.)		3		1	1		1	2	8
Gang foreman		1	1		1		1		4
Glazier		1							1
House electrician								2	2
Ironworker					1		1		2
Janitor			1				1		2
Laborer	6	29	12	29	27	27	29	16	175
Lead burner			1						1
Machinist		1		3	1	1	2		8
Mason	1	1	1		2				5
Miner		1							1
Modeler				1					1
Moving man					1				1
Office clerk		1					1		2
Painter						1	1	2	4
Pipefitter		2			1		1		4
Plumber						1			1
Potter				1					1
R.R. car inspec.	1						1		2
R.R. conductor					1		1		2
Stat. engineer		1					1		2
Station electrician		2	1						3
Steam shovel operator							1		1
Supt. cigar factory							1		1
Tailor				1					1
Tinsmith						2		1	3
Tractor driver								1	1
Trouble shooter		1							1
Truck driver		1				3	1		5
Veterinary			1						1
Watchman		2			2		1	1	6
Welder				1					1
Total	8	51	24	45	45	41	46	32	292

Table II. Analysis of the occupations of the fathers

Can Do This Work Better

The second highest influence, *can do this work better,* was closely related to the sixth highest influence, *knew something about the trade.* These factors rated high because most students had, through home workshops and industrial-arts courses, experiences with tools and materials related to the trades taught. One hundred and twenty-one students, or 41.44 per cent had home workshops, and 202 students, or 69.17 per cent had had industrial-arts courses.

The experiences that caused the students to feel that they knew something about the trade they had chosen were gained through repairing light sockets, hooking up simple bell circuits, installing outlets, constructing radio sets, painting and papering rooms, helping to build sheds and garages, repairing cars with older members of the family, soldering, experimenting with chemical sets, and constructing models.

Some students checked the influences mentioned because they had a feeling, idea, or intuition, that they could do this type of work better.

Easier Than Laboring

When one considers that 175 students, or 59.99 per cent have fathers who are laborers, and that no one likes the insecurity, toil, and lack of social prestige of the laborer; the third highest influence, *easier than laboring,* is readily accounted for.

It is important, however, to point out that approximately 60 per cent of the students didn't consider this item principally because they felt that the work in their trade was just as strenuous physically as laboring. The boys seemed to be very sensitive about work, and in almost all cases they felt that checking, *easier than laboring,* meant that they were afraid to work hard.

Parents Want Me to Take the Trade

The influence that parents have upon their children's choices of a trade is, perhaps, greater than the percentage revealed in this study. This statement is made because information gained from the parents affected, to some degree, almost every influence the student checked. The sorry part concerning the parent's choice of their child's trade is that too often the parents are insistent upon a certain trade without considering the child's abilities, likes, dislikes, or the future possibilities of the trade.

Always Get a Job With This Trade

The fifth highest influence upon the choice of a trade was, *always get a job with this trade.* Interviews with the students brought out the fact that the majority of students felt that, since this was an age of machines and electricity, any trade connected with either of these would always require skilled workers.

The students had very little information concerning the possibilities of such trades as painting and decorating, plumbing, and sheet metal which were considered very poor trades from the standpoint of security, wages, and hours of work.

Job Security and the Choice of a Trade

That job security is an important factor with adults, cannot be denied. What effect has job security upon the student's choice of a trade? In order to determine what effect security had upon the student, this question was asked:

"If you were guaranteed a steady job with good pay, would you care what trade you had to study?"

Of the 292 students answering this question, 213 or 72.94 per cent didn't care what trade they studied. Why did the 79 or 27.05 per cent refuse to accept the above guarantee of security? Was the promise of job security a negative quantity to them, or were other factors conditioning their responses to the question?

In order to answer the questions raised, the students who refused to accept the security guarantee were interviewed.

The interview disclosed the fact that the 79 who refused the job-security guarantee did so because they hated certain trades. Their hatreds were so strong that even the guarantee of job security couldn't induce them to study the trade they disliked.

It is interesting to note the reasons why students disliked certain trades even to the point of hatred. The reasons which were given might be considered childish and of little importance to the adult mind, but let it not be inferred that the students were not sincere and earnest in their beliefs. They were, on the contrary, very positive in their beliefs, and many would rather quit school than study certain trades. Of course, with the proper guidance, most of the hatreds could be and have been easily abolished.

The majority of the hatreds were caused by misinformation.

The following list is a representative sampling of the reasons why students disliked certain trades:

"I don't like the electrical trade because it is too complicated and too dangerous."

"I don't like chemistry because there are too many acids, poisons, and fumes."

"I don't like the machinist trade because it is a very slow kind of work with heavy materials. I am also afraid of breathing in dust when I file."

Trade of father	Number of fathers	Number of sons who chose trade of father	Per cent
Carpenter	15	3	20
Chemist	1	0	0
Draftsman	1	1	100
Electrician	6	2	33.3
Machinist	8	3	37.5
Painter	4	0	0
Tinsmith	3	2	66.7
Total	38	11	

Analysis of data shown in Table II

"I hate painting because I never did like it. I haven't the patience to fool around with it. Everybody does their own painting, and anyway I can't stand the smell of paint, it makes me sick."

"I don't like sheet metal because I hate the smell of the solder and the chemicals used in soldering. I do not like to work with metal no matter what kind it is. Most of all I don't think I would like to make stove pipes and drain pipes so much."

"I don't like woodworking because it is too tiresome, and I'm afraid of the machinery."

This list contains the names of only a few trades disliked. The students were not partial in their hatreds. Every trade taught plus many not taught were mentioned as being disliked by at least one or more students.

Relationship of Father's Trade to Son's Choice

An analysis of the data presented in Table II presents the following facts in answer to the question: "What is the relationship of the father's trade to the son's choice of a trade?"

From the figures it may be concluded that the relationship between the father's trade and the son's choice is not very high. However, it must be remembered that it is unsafe to draw broad general conclusions from the data presented because the data include such a small percentage of the total vocational-school population, and the total number of students having fathers with trades taught in the school is very small.

Nationality and Its Influence on the Choice of a Trade

The distribution of nationalities in the various trades taught is shown in Table III. The predominant nationalities represented are: Hungarian, Polish, Slavish, Ukrainian, and German. These nationalities are fairly evenly divided, and from the distribution of the various nationalities throughout the trades taught, there doesn't seem to be any shop preference.

Nationalities	Chemist	Electricity	Mechanical Drafting	Machine Shop	Painter	Sheet Metal	Woodworking	General Shop	Total
Hungarian	2	16	2	19	16	2	16	6	81
Polish	2	8	5	9	10	18	14	6	72
Slavish		8	3	3	4	7	5	5	35
Ukrainian	3		2	6	4	3	1	4	23
German	1	3	4	5		3	2	3	21
Russian		1	5	1	3	2	2	1	15
American		6					4	1	11
Danish		1	1		4	1		1	8
Italian		2		1	1	2	1		7
English		1	2		1	2			6
Irish				1	2		1	1	5
Lithuanian								3	3
Portuguese		2							2
Scotch						1		1	2
Spanish		1							1
Total	8	51	24	45	45	41	46	32	292

Table III. Distribution of nationalities

One important factor, from a teaching and guidance standpoint, is the fact that 242 fathers, or 82.88 per cent and 227 mothers, or 77.74 per cent are foreign born.

Although it is not the purpose of this study to enlarge upon the above problem, yet the importance of this factor cannot be ignored in the construction of a curricula, particularly the related technical and academic curricula wherein the ability to read, interpret, and converse intelligently in English is required.

From the standpoint of teacher-pupil understanding, from the standpoint of building desirous traits of character, and from the standpoint of creating respect for and appreciation of democratic ideals and institutions, this factor of foreign parentage is of tremendous importance.

The student, ordinarily, represents a cross section of his family. He has, generally, the religion of his family, the customs of his family, the nationality of his family, the political ideals of his family, the likes and dislikes of his family, the social status of his family, and the community interests of his family. If the family from which the student comes has not adjusted itself to the institutions, ideals, customs, and traditions of the new world in which it finds itself, clashes may arise because of the student's *new world* viewpoint and the parents' *old world* viewpoint.

The teacher should learn as much as possible about the customs, morals, traditions, history, and educational systems of the native lands of the parents of the students, in order that he might have a more sympathetic understanding of the student's parents, and in order that he may assist the student in achieving an appreciation and understanding of his parents' reactions. Without this knowledge, the teacher cannot hope to have a sympathetic understanding of the student-parent relationships — the understanding of which are so essential if real teaching is to be done.

Conclusions

The following conclusions may be drawn from the data presented:

I. The six most outstanding influences upon the choice of a trade in the vocational school studied are:

1. Big money in the trade.
2. Can do this work better than any other.
3. Easier than laboring.
4. Parents want me to take the trade.
5. Always get a job with this trade.
6. Knew something about the trade.

II. Job security is of such importance that approximately 75 per cent of the students would study any trade if they were guaranteed job security.

III. Students have very definite likes and dislikes for certain trades. These likes and dislikes are of such importance that 35 per cent of the students would sacrifice job security guarantees rather than study certain trades.

It is important to the school to know which students have definite trade hatreds because it has been found that the majority of hatreds can be overcome by education.

IV. The data indicate that the relationship between the trade chosen and the trade of the father is very small. Of course, this statement is conditioned by the small number of students studied.

V. The data collected reveal that nationality had very little influence upon the choice of a trade. The various nationalities do not concentrate in certain trades, but are distributed fairly evenly among the trades.

VI. Approximately 80 per cent of the students have parents who were born abroad. This fact is of importance from the standpoint of teacher-pupil adjustment, curricula building, and social and educational guidance.

VII. The data, in general, offer evidence that the new students entering the vocational school have little or no knowledge of the world of work and its possibilities. This fact should be recognized and steps should be taken to provide the prospective vocational student with this knowledge in order that his selection of a trade might be made more wisely.

The Learning Process

Tilden Collar

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A job may be defined as a piece of work done, or to be done. The efficient performance of a job requires manipulative ability and technical knowledge. These elements will vary according to the job.

A method for doing a job is probably first worked out by trial and error, and improved on from time to time until a standard practice is developed. When someone who knows how to do a job undertakes to assist an individual, or group of individuals, in acquiring that ability, he becomes a teacher.

If there is usually one best way of doing a job, it is reasonable to assume there is a best way of teaching a job.

The first operation in the work of an instructor is to determine what there is for him to teach. The line of instruction must be based on an analysis of the work required by the position in which the student is to function.

There are two general systems of training. One is where new men "pick up" their work as they can, and the other is the organized teaching system where training is done by intention. The first system is known as experience or self-training, the second system requires an instructor.

What Instruction Is

Instruction is the use of methods and devices which will stimulate the student to the required action, mental or manual, necessary to insure his remembering or doing the thing that is to be taught.

Telling is not instructing, drilling is not instructing, showing is not instructing. None of these things, in themselves, will produce the required result because they involve no necessary activity, mental or manual, on the part of the learner. By the use of various devices, however, this activity can be secured; and then, telling, showing, and drilling may become a part of the instructing process.

Instructing Process

The instructing process is carried out in a series of four steps: (1) preparation, (2) presentation, (3) application, (4) inspection.

The preparation step in the teaching process deals with the teacher's act in getting the learner into a mental state of expectancy toward the job which he is to learn. It involves the act of raising in the learner's mind the query "How do you do it?" and "How is it different from what I already know?" It is a *mind centering* process by which the learner is caused to bring up in his mind all the information which he possesses about the subject that is to be taught. The situation is ideal when the learner reaches the point of desiring to acquire the knowledge or skill. Educators call it motivation.

A good review lesson for all who teach.

In this step the instructor takes the initiative. The method selected and the time necessary to put it across is a matter of good judgment. Even in the simplest lesson there is a need for the preparation step; its omission will increase the difficulty of learning. People learn easier if they can see a reason for learning, or if there is a personal advantage in knowing, or being able to do.

Preparation must be complete before presentation is started. Preparation gives no additional or new information. The following methods may be used:

1. Suggestive questioning, which will stimulate group thinking about: past experience, previous lesson or lessons, a need for knowing, personal advantage for knowing.

2. Suggestive illustration — Using pic-

tures or sketches where the learners lack sufficient background.

3. Instructor cites a story or experience which is to the point.

The presentation step. In this step the instructor puts across the new lesson material by use of some suitable method; this is best accomplished by "tacking on" the new ideas to what the learner already knows. What the learner already knows is called the apperceptive basis.

The following methods may be used:

1. The demonstration method which consists essentially in showing the learner how to do the job or solve the problem. In this type of lesson, it is good to repeat the demonstration two or three times with the instructor giving the necessary explanations as he demonstrates. This gives the class a better chance to grasp the idea. The explanation has to do with the "why" of doing the job in a certain way. The explanation may not always be necessary, but it appeals to the students' intelligence, and answers the unasked question, "I wonder why we are taught to do it this particular way?"

2. The illustration method consists essentially in putting up to the learner, not the actual things with which instruction deals, but things which resemble them sufficiently to serve the purpose. This method in some cases has to be used, but it is inefficient in that it requires a certain amount of mental picturing on the part of the learner.

3. The lecture method which consists essentially in simply passing out the information required. This method can be used to advantage only in the case of very advanced students who have so much knowledge of the subject already that they can easily follow and understand the lecturer. Outside of the regular work of instruction there is usually a field for the development of general interest, and the lecture method may be used for that purpose.

The application step. Application is the third step in the process of instruction. The student has heard the instruction, and has seen the demonstration. He, however, has not proved at this point that he can follow the instruction, and the teacher has no evidence that the student has grasped the instruction and made it his own. It is in this application step that the learner is given an opportunity to do the job which was presented to him. If he has difficulty, the instructor gives him assistance. The instructor should not consider leaving this step until he is reasonably sure that the student has learned the lesson. Individual instruction is the rule under this step.

The following methods may be used:

1. Direct application: Trying out the job. Instructor assists when necessary, and asks suitable questions for checking essential knowledge. This is the most effective method.

2. Directed discussion: The instructor sets up a discussion wherein various members of the group ask questions. By watching and guiding such a discussion, the instructor can often check the degree to which the students have been instructed.

Inspection. The fourth and final step is that of testing. If the instructional process has been properly carried on up to this point, the instructor is ready to take a chance that the learner has been properly taught, and if he is right, the teaching job is finished. The learner is instructed, he can do what the instructor intended that he should be able to do, or he knows what the instructor intended that he should know. The teaching unit has been put over and the teaching process is at an end. At this step the instructor must now stop being an instructor and become an inspector. He must proceed to inspect the results of his teaching. In some suitable way the ability of the learner to do the entire job alone must be tested.

Methods for carrying out the test are:

1. By doing the job without assistance. (Suitable for simple manipulative jobs.)

2. By doing the job without assistance, and explaining principles involved, reasons for the several operations or procedure. (Suitable for more complicated jobs.)

3. By the written test which is suitable for lessons in plan reading, related theory, and information content.

Comments on Procedure

A lengthy address is not necessary for carrying out the preparation step. Suggestive questioning is the most satisfactory method of accomplishing this step in the minimum of time; capitalize on the need or value for learning.

In the presentation step it is necessary that the instructor present just the new ideas or knowledge proposed to be given at this time. This should be a clean-cut piece of work; and nothing should be considered during this step which is not included in the instruction meant to be taught in the lesson. Head off irrelevant discussion and conversation.

If a series of ideas is to be presented, they must be presented in the most effective order, this order having been previously determined by the instructor. An efficient teacher will pay a great deal of attention to using an effective order in presentation. The failure to do this is a very common error of untrained instructors.

Emphasize the more important points. It takes skill and practice to pick out the important points.

In the presentation and application steps, the instructor should ask questions so worded as to require definite answers and stimulate thinking concerning the lesson. The poorest way for the instructor to find out if the class has the idea, or understands, is to use the following questions: (*a*) Is this clear to you? (*b*) Do you all understand this now? (*c*) Are there any questions?

There is an unappreciated value in repetition. It fixes the idea in the mind of the student. Often a slight change in the wording of a question will make it more effective and interesting.

Effective instruction is measured by the fact that at the completion of the instructional process the learner has completely grasped the new idea, or can do the new piece of work with the least expenditure of time, energy, and effort on the part of both the learner and the instructor.

Difficulties Encountered by the Untrained Instructor

1. He knows his job but cannot analyze it into jobs, or instruction units.

2. He does not know how to arrange his jobs into an effective instructional order.

3. He is often unable to distinguish between what must be taught as jobs and what should be given to the learner in the form of information.

4. He does not know how to teach any given job rapidly, effectively, and thoroughly.

5. He does not know how to handle learners under instructional conditions though he may know how to handle men under production conditions.

6. He teaches too much in one lesson.

7. He adopts an unsuitable method.

8. He fails to complete each step before starting on the next.

9. He fails to include all steps in the lesson.

10. He fails to distinguish between steps in the lesson plan.

11. He fails to take sufficient time to teach the lesson.

12. He lacks patience and tact in teaching the lesson.

13. He undertakes to teach the lesson under unsuitable teaching conditions.

14. He over- or underestimates the student's knowledge of the subject.

Fitting pistons in the auto mechanics department, E. D. Libbey High School, Toledo, Ohio. S. D. Lockwood, instructor

Men in the Making

Dean M. Schweickhard

Assistant Superintendent of Schools, Minneapolis, Minnesota

How can education be so administered that youth will grow into ideal manhood?

A Renewal of Purpose

It has become the custom throughout most of the civilized world to eat three times a day, and sometimes oftener. Likewise automobiles need refueling, batteries need recharging, houses need repainting, and lawns need periodic watering. Similarly good purposes once established will not perpetuate themselves in the highest possible degree without the nourishment which comes from the lives of those who have pursued similar purposes through to the ultimate goal of success.

The month of February contains the birthdays of two great Americans whose lives have been a source of such inspiration to countless thousands through many successive generations. Strangely, masses of the contemporaries of both of these men, differed sharply with them, while great numbers of others were willing to stand with them to the death. It was not unanimous approval in their own time then that has made them so vividly remembered, but something which calls for much deeper courage if it is to be possessed.

In school life various viewpoints appear now and then which indicate the need of renewed vision. It may be a boy of fifteen or sixteen years who casts his eyes upon the ground at his feet and in his shortsightedness makes the hasty conclusion that he has acquired all there is to be desired in education. Or the teacher may labor long and well in the preparation of an analytically perfect course of study and then stand like an immutable guard over it for fear someone might suggest a modification here or there to suit new times or circumstances. Even the school organization itself may be looked upon as something too sacred to change because of the form in which it was originally established. The fundamental requisites in each of these instances are readily discernible. First there must be a recognition of one's own limitations; second a quest for enlightenment wherever it is available; and third a willingness to pursue the light into better ways.

Carrying the Load

Among young and old alike there seems to be a strange mixture of conflicting emotions. One may seek various kinds of help from others, but frequently when it is offered without being requested it is rejected. This is particularly true of advice or admonition which may savor too strongly of preaching. The adult who thus bluntly seeks to inject his advice into youth often resents the rejection as an insult to his age and wisdom. More seasoned thinking brings forth the conclusion that the refusal to wholly accept another's admonitions is an indication of one's desire to seek out his own way, form his own conclusions, and carry his own load. Of course there is the matter of courtesy to be considered, but the underlying principle is worth thinking about.

The two great characters, whose memory we revere in the month of February, possessed this quality of carrying their own load to a marked degree and found ample opportunity to exercise it. Abraham Lincoln, in his youth, distinguished himself as a rail splitter, and George Washington won recognition as a civil engineer of ingenuity, courage, and ability. Each in his own way met difficult and baffling circumstances and struggled through to a victorious conclusion.

The experience and example of these men does not mean that to make more vigorous, virile, and courageous men today we must wait for another vast forest to grow, and out of it split rough rails for primitive fences. Nor does it mean that we must return to the comparatively primitive methods of surveying as employed in colonial days. It does mean, however, that if the perplexing and nerve-rending problems of today were attacked with the same vigor, directness, and determination with which these noteworthy pioneers attacked their problems, ours would be more surely and satisfactorily settled.

One of the most distinguishing features of the method of procedure utilized by these men of early days was not a spirit of arrogant independence, nor passive dependence upon others, but a positive spirit of self-reliance. They learned a lesson from every experience, and kept it in reserve for later use when needed. In numerous instances they gave vivid evidence of fighting a battle with the physical elements, and later utilizing the residual lessons in facing moral, political, social, or economic problems.

Perplexities of Complex Organization

From early times to the present our national life has become increasingly complex, and all phases of it have become more and more highly organized. Education is no exception to this trend, as one kind of training after another is introduced into schools in an organized system. Under modern circumstances the skills and technical knowledge of many vocations can be taught with a high degree of perfection in school, but too often there is danger that some of the valuable lessons learned by the out-of-school method will be lost.

Some school people, realizing this danger, have put forth well-intended efforts seeking to develop initiative and resourcefulness on the part of the child. Too frequently, however, the methods used have resulted in confusion rather than progress. In the general shop or the progressive classroom it is well enough to provide opportunities whereby the child may seek facts, draw conclusions, and learn lessons for himself, but if his procedure is to be effective, the conclusions true, and the lessons of permanent value there must have been some conscious planning on the part of the instructor.

Even in well-organized industrial-arts classes the teacher and the students may become so absorbed in analyzing mechanical processes and making *things* that they forget some of the more fundamental values. The quest for these values should be more evident to the teacher than to the students, and should be so adroitly intermingled with the work that they will be surely accomplished.

The retention of the manipulative element as a means for effective education becomes increasingly important as this tendency toward greater complexity grows in all phases of life. Along with greater ease in housing, transportation, communication, and the fulfillment of material needs without physical effort, there is danger that some of the qualities that weaken men and women may gain a tighter grip. Without constant effort to the contrary it becomes easy to lay the blame on others for such things as: (1) loss of temper, (2) moral failure or laxity, (3) tardiness, (4) mistakes, and (5) accidents. Credit to oneself is much more likely to be claimed for: (1) financial success, (2) high-mindedness, (3) control of objectionable emotions, (4) notable achievements of mental or physical skill, and (5) accuracy or good judgment. Constant contact with material things enables the individual to maintain a much truer sense of relative values, and thereby to carry that sense into more intangible realms. It is possible that in this way we may be able to carry over to the modern day the same kind of value our forefathers gleaned from the rigors of frontier life.

The Specifications of a Man

The comparison of one life, or mode of living, or plan of education with another, whether contemporaneous or not, is likely to lead to some misdirected impressions without due deliberation. The greatness of George Washington and Abraham Lincoln is often given a military significance because each was at the helm of the nation during a major military conflict. Their resort to arms was in defense of a principle

they believed to be right rather than for the glory of participation in armed conflict. And still we encounter difficulty in eradicating the idea in some quarters that the supreme specification for *a man* dresses him in military uniform and has him prepared to go forth to destroy other young men who according to their own standards have also sought to become worth-while men.

Would it not be much more to the point to ask ourselves what makes men, rather than what means we can devise to destroy them? Such questions as these may point the way. Is a well-lived and well-directed adult life of any value to oncoming youth? As a child did you look upon any adult as an ideal? What characteristics did he have? Did your chosen ideal ever fall? If so, what was the reason, and what effect did it have upon you? If it were possible for you to begin life over how would you do differently than you have done thus far?

A little historic observation will reveal very clearly that when a nation begins to decay the process starts with the adults, not with the youth. Youth maintains its hope and seeks its ideals until stifled by the odorous infection of adult society. To find the specifications of a man, then, let us turn to youth where there are myriads of men in the making, and by the prudent utilization of these invaluable resources build a nation that shall endure.

Organization of Model Airplane Clubs in Schools

S. S. Zamory

Industrial Arts Instructor,
Sidney, New York

Growth and Value of Model-Airplane Building

The interesting and instructive activity of model-airplane building is comparatively new. Its appeal and popularity, however, places it near the top among leisure-time activities or hobbies for boys. Since the world war days this activity has grown from a few small scattered clubs to the numerous clubs that we have now in this and other countries. From back-yard activity we have graduated to state, national, and international competition. The model-airplane supply business is now a three and one half million dollar industry in the United States. At the last national contest, after local and state eliminations, there were over 700 entries.

Model-airplane building is more than a pastime as are many of our leisure-time activities. It has long served as a part of our aeronautical-engineering and design courses. Many of our pioneers in aviation used models for tests before attempting to build man-carrying machines. We find our foremost engineers and aircraft designers using models for initial testing of ideas. Principles of flight are always the same and often knowledge gained from the model field can be applied to commercial aviation. We should encourage the boys to take up model-airplane building for in doing so we will add to the number of those who, without conscious effort or tedious study come to have an understanding of the principles of aeronautical science and the method of operating airplanes, which play so important a part in the world of today.

Obtaining Initial Interest

In organizing any activity or club, initial interest is necessary. There are several ways of obtaining this. If there is an organized model-airplane club near you, the members will be only too glad to visit your school and give your boys an actual demonstration of flying models. This is one of the best methods for obtaining initial interest. If however, that is not possible, you can start up several other ways. Perhaps a few of your boys have a model or two and can give a demonstration to the others. Then also the instructor can build one or two simple models to use for the first demonstration. Whichever method is used for obtaining initial interest, there must be a follow-up at once. The first meeting should be held as soon as possible and matters such as election of officers, membership rules, time of meeting, and the like should be taken up.

Officers and Membership

Here at Sidney, the club has a president, vice-president, secretary, and treasurer. They are elected by the members for a period of six months and can be re-elected. Our meetings are held every Monday evening from 7 to 9 p.m. All of the model work is done during this club period or at home. In my opinion this works more satisfactorily than allowing it to enter into the shop periods, as the great amount of time spent on models would interfere with the other work which has to be covered. The dues in our club are fifteen cents every three months. This isn't much but it gives the boys a feeling that they have a genuine organization when they pay dues. The question also arises as to when a boy can join. We accept any boy who can build a simple glider. Some of our members are from the fifth grade, and have set the upper age limit at 21 years. For contest purposes, boys up to 16 years of age are classed as juniors, and those 16 or over, as seniors.

Operation

Having arranged for the first meeting, the boys must have something to work on right after this meeting. For a starting model, mimeographed plans of a glider can be distributed to the boys. Material has to be handled by the instructor or some dealer in town. Materials can be purchased from a number of firms whose ads appear in this magazine and in model-airplane magazines. These magazines also contain plans for simple as well as advanced models. As the boys progress, plans for stick models, R. O. G. (rise off ground)

Sidney Model Airplane Club

models, and fuselage models, can be given out. The beginning models should be small and simple in construction. After the first four or five models the boy can find his own plans and be able to carry on more or less on his own. It is advisable to include instruction sheets with the first four or five plans.

Our business meetings occupy approximately a half hour after which we build and test-fly the models in the school gym. Speakers on aeronautical subjects should be obtained whenever possible for these meetings. New developments in the field of aviation should be discussed and explained. A scrapbook of pictures of planes, etc., should be kept in the club library.

Publicity is not to be overlooked. Give the boys public recognition for winning contests and other achievements. Let the people know what the boys are doing by newspaper write-ups and model exhibits in stores. We invite the public to our contests and no admission charges are asked. Newspapers will publish pictures of your club if you ask them to.

Contests and Awards

When you begin to talk of awards you must also take up finances. Our Sidney club is sponsored by the local Exchange Club which contributes generously toward prizes and awards. Some of our businessmen also contribute funds and trophies. I am sure that your town or city has organizations or persons who will gladly do the same.

Our contests are held on the average of once a month. They are both of the indoor and outdoor types, depending on the season. The boys are given at least three weeks advance notice of the date and events to be held. It is best not to have more than three events for the first few contests. Our contests are held as closely as possible to National Aeronautic Association rules and specifications which are explained later. The reason for this is that the majority of state meets and the national meet are N.A.A. sanctioned, and in order to enter them, your models must conform to their rulings.

Besides the prizes that we award, we have a point system giving 100, 75, 50, and 25 points for first, second, third, and fourth place respectively. These points are counted toward the high-point trophy which is awarded annually. Such a trophy helps to maintain a fine competitive spirit among the boys. It is advisable, as soon as progress is shown, to hold invitation contests with other clubs in the vicinity. Records should be kept of winners and their flight times for reference in sending boys to state and national meets. Boys should be classified as juniors under 16 years of age, and seniors up to 21 years of age, giving duplicate prizes for each event. We have found that medals and pins are more desirable than merchandise prizes.

We encourage progress by a system of certificate awards, having higher requirements for each one. To earn a Model Builders Certificate the boy must build and fly a R. O. G. stick model for at least 30 seconds. To earn an Advanced Model Builder certificate he must build and fly a scale model for 10 seconds or more and a stick model for 1 minute or more. To earn an Expert Model Builder certificate he must build and fly the following; indoor microfilm model, indoor stick model, each to fly four minutes, and outdoor stick model and fuselage model each to fly for two minutes.

Contest Rules and Definitions

As mentioned before, it is desirable to become affiliated with the National Aeronautical Association, which is a noncommercial, patriotic, nonprofit organization for the promotion of aviation in the United States. The association promotes more than just model airplane clubs; all the important air meets such as the National Air Races and the Miami Air Races are N.A.A. sanctioned and supervised. When your club is an N.A.A. member and you a director, any records timed by you will be officially recognized. For further information write to National Aeronautical Association, Dupont Circle, Washington, D. C.

The following rules and definitions are very similar to those of the N.A.A.:

Number of Models — A contestant is allowed a maximum of three models in each event. He may fly any or all of them.

Number of Flights — A contestant is allowed a total of three official flights. A flight is a start that lasts more than 20 seconds on outdoor models and 60 seconds or more on indoor models.* Any flight less than the specified time shall be called a delayed flight. Three delayed flights are counted as one official flight.

Time of Flights — Flight time starts the instant a model is in flight and ends when the model touches the ground or floor, or when an obstruction prevents further flight. Time also ends when a model passes from a timer's sight. If a model meets an obstruction and falls free independently and resumes flight within ten seconds time shall continue uninterrupted.

Outdoor Model — The area of the effective main supporting surfaces shall be no less than 100 sq. in. Models shall weigh no less than 3 ounces for every 100 sq. in. of effective wing area. If ballast is used to bring model to required weight it shall be securely attached.

Indoor Model — The main wing area shall be no less than 30 sq. in. and no more than 150 sq. in.

Hand Launched — A model is hand launched when it is released for flight from the hands of the launcher. The model shall be launched from an elevation of not more than six feet from the ground or floor.

Rise Off Ground (R. O. G.) — An R. O. G. model has a landing gear which permits it to take off from the ground under its own power. The landing gear must be strong enough to support the model while taking off and landing, and its usefulness must be demonstrated by gliding a model from a height of at least four feet, landing without damage and without nosing over. The wheels shall turn freely and be of such size and strength as to permit the model to taxi freely on an ordinary platform.

Fuselage Model — A model of the fuselage type has a built-up enclosed fuselage. The minimum area of the maximum cross section of the fuselage shall correspond to the formula $\frac{L^2}{100}$ where L equals the over-all length of the model excluding the propeller. The fuselage shall be not less than 90 per cent covered. When rubber is used for motive power it shall be contained entirely within the model.

Stick Model — A model of the stick type has a single stick for its body. Models using tubes and those that are not classed as fuselage models are stick models.

Note — For the first few contests it is not necessary to require minimum time for any official flight.

Reference Material

The following books and magazines are useful in connection with model-airplane work:

Building and Flying Model Aircraft, P. E. Garber, Ronald Press, New York City. 10 cents.

Building Model Airplanes That Fly, E. T. Hamilton, Harter Publishing Co., Cleveland, Ohio.

Model Aeronautics Year Book, Frank Zaic, Model Aeronautics Publ., 83 E. 10th St., New York City. $1.

This Flying Game, Gen. H. H. Arnold and Major I. Baker, Funk and Wagnall Publ., New York City.

The Romance of Aircraft, L. Y. Smith, Frederick Stokes & Co., New York City.

Knights of the Air, L. J. Maitland, Doubleday, Doran & Co., Garden City, N. Y.

The Airplane Speaks, H. Barber, Robert M. McBride & Co., New York City.

Magazines

Model Airplane News, Jay Publishing Co., Mount Morris, Ill.

Air Trails, 79 Seventh Ave., New York City.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Milwaukee, Wis.

Conclusion

Right now, the United States Department of Education is investigating the aviation education carried on throughout the country. In their questionnaire the important field of model-airplane building is checked upon for they realize the great amount of background a youth can accumulate from his model work. The future for model building is unlimited. Aviation today is progressing so rapidly that even the engineers have a difficult time keeping informed on the different developments. Our youth are decisively air minded. With all its natural appeal and great possibilities, why shouldn't model-airplane building become a part of your clubwork program?

The public schools are practical instruments of a practical democracy. As such, they operate within practical limitations of resources and of public will. As a practical matter, the schools which offer instructional programs based on a realistic understanding of the distribution of occupations and occupational levels in their communities are likely to get the more generous and more enthusiastic public support. — *Occupational Adjustment Interim Report, National Occupational Conference.*

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION
J. J. Metz, Editor

Printing Education Week

Teachers of industrial arts and vocational education can learn much from their fellow workers in the field of printing. These printing instructors, while belonging to other professional associations, felt that the subject which they were teaching was so important that they also formed The National Graphic Arts Education Guild. Out of this grew the dedication of a special week to be known as Printing Education Week, and this year will see the twelfth consecutive observance of this special week, January 15 to 20, having been set aside for it.

Besides the annual observance of Printing Week, the printing teachers are strenuously working to have Benjamin Franklin's birthday, January 17, declared a national holiday.

It may be argued that Benjamin Franklin, because he did such outstanding work in many fields of human endeavors, might equally well be chosen as the representative of the electricians, the scientists, of public-service bodies, and of the men in many other lines of work. A glance over the list of the many offices which he filled as a public servant alone will show his untiring energy and versatility. He was speaker of the Pennsylvania assembly, postmaster of Philadelphia, postmaster general of the colonies, colonel of the Pennsylvania militia, president of the Pennsylvania Commission of Safety, commissioner to Canada, agent in England for the colonies, member of the committee that drafted the Declaration of Independence, United States commissioner to France, member of the Continental Congress, United States Minister plenipotentiary to France, United States commissioner to negotiate peace with Great Britain, governor of Pennsylvania, founder of the American Philosophical Society, founder of the Philadelphia Library, founder of the University of Pennsylvania, and founder of the Philadelphia Fire and Police departments.

In describing him one may summarize the activities in which he engaged during his lifetime by saying that he was a printer, editor and publisher, financier, economist and teacher of thrift, philosopher, moralist and advocate of the simple life, scientist and patron of education, philanthropist, statesman, diplomat, and patriot.

Personally, however, he always liked to refer to himself as a printer, and when he wrote the epitaph which he wanted carved on his tombstone, he started it with the words, "The Body of Benjamin Franklin, Printer ——."

The year 1940 is especially significant to the printers for it marks the 234th anniversary of Franklin's birth, the 150th anniversary of his death, the 200th anniversary of his founding of the University of Pennsylvania, the 500th anniversary of the invention of printing from movable type, and the 300th anniversary of the printing of the first book in that part of North America now known as the United States.

The printers are to be congratulated on having chosen Benjamin Franklin as their model. It is to honor him and them that a cut of Franklin was selected to grace the cover of this issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. These teachers are to be further commended for the excellent work which they are doing not only for their students, but in raising their own professional standards. They are setting a fine precedent, and their example ought to be studied with care, and adapted and adopted by the teaching fraternity in other shop branches.

Conflicting Demands

At the thirty-third annual convention of the American Vocational Association, held at Grand Rapids, Mich., December 6 to 9, 1939, the program provided many speakers of national repute who discussed subjects which are of vital concern to the educators interested in the fields of industrial arts and vocational education. Most of the speeches were instructive and constructive, inspiring the listener to make greater efforts to bring his own work on a par with that done by others.

There were, of course, also those speakers who decried the efforts made by the schools in preparing students for entry into the world of business and industry. Remarks such as these were heard: "There is room for the employment of many thousands of skilled workers if they were available"; "A large percentage of those who cannot find jobs are without work, because they do not have the necessary ability and experience to fill the places that are open"; "There seems to be a dearth of really competent persons"; "Despite high-school business courses, colleges, and business schools, competent stenographers are very difficult to find. One in 25 only is passable"; "We have the greatest difficulty in securing competent salesmen."

Most of these quotations are credited to so-called business executives. The remarks came glibly from the tongues of the speakers, frequently men who have had no experience in teaching, and no knowledge of what confronts the teacher. It was impossible, of course, for the hearers to check the correctness of the remarks that were made. A little scrutiny of them, however, may be good for the morale of those engaged in vocational education.

If there is room for the employment of many thousands of skilled workers, why are there still many skilled workers who cannot obtain steady employment? What is industry doing about making it possible for the skilled man, whom they have scrapped and forgotten since the beginning of the depression, to move, say from a manufacturing town in Wisconsin, to a plant in Michigan or Ohio, where his skill is needed? What assurance will industry give to such men that they will be given a decent wage after they have actually left their families and homes for employment in a strange community, and that if they are not employed, that they will not be left stranded far away from home? Why, if industry is so concerned about training skilled men, are there so many willing young high-school graduates begging for a chance to serve apprenticeships without finding employers willing to give them the opportunity of proving their worth? These employers must know that present-day national apprenticeship contracts practically all embody a clause granting a three-month trial period before the contract becomes binding on the learner and on the employer. If the learner shows that he is inadequate either in ability, capacity, or attitude, or if he should find working conditions not to his liking, either he or his employer may terminate the agreement before or at the end of the trial period, without being guilty of breach of contract. Industry and business, therefore, have the power in their hands to train as many skilled workers as they may think they need for present and future use. They will further find that the school

is most anxious to cooperate in furnishing the right kind of training, but business and industry must also realize that they have a responsibility.

Trade and occupational analyses have been developed not by industry, but by the teachers and educators who were earnestly trying to do a good job. Some of them went to industry for a checkup and received but halfhearted assistance because making an analysis is a big job which cannot be accomplished by merely talking. Industry itself, with the exception of a lamentably small number of firms, cannot point with great pride to what it has done in the training of its own workers, and business, also with comparatively few exceptions, has done practically nothing in this line until the past few years.

As to the statement that large numbers are jobless because they lack ability and experience — that is undoubtedly true. Neither business nor industry, however, explains nor seems to care that there are still skilled mechanics, experienced office workers, and well-prepared men and women either unemployed, working at jobs with small pay for which they had never been prepared, or worse still, working on WPA jobs. To these people, such phrases as "We could employ thousands of skilled workers if they were available," sounds like hollow mockery. There are toolmakers who have been without work in their own trade for years. Probably they were not the best of their kind at any time. Nevertheless, they are, especially if they are middle-aged men, what they are because of the training they received directly from industry. If these men were given a chance by industry to regain the skill and knowledge they have lost during the period when industry and business did not need them, there would be quite a source of supply of workers possessing at least a sizable foundation of skill. Then, too, industry and business is vociferous in stating what it wants, but is not at all adverse to hiring skilled men at minimum wages and for short periods of time so that the workers hardly make a living, although they have invested time and money into the acquisition of the skills which the business world claims are so necessary. Industry, in the main, is proud and exceedingly careful of its fine machinery with which such beautiful, accurate work can be done, but it is infinitely less concerned with the men who are to run this machinery. The machines devour considerable overhead when they stand idle — the mechanics who are idle with the machines are simply laid off. Even the unemployment insurance, now in vogue, will not compensate the man who has spent years in acquiring skills which industry demands.

Then, too, industry and business want workers of "ability and experience." Schools are able to help students to acquire skills up to a certain level, if business and industry do not harp too strongly on cutting the schools' appropriation. At its best, however, the school cannot furnish the experience. The students working at and on the job are the only means of furnishing him with that requisite.

Competent salesmen, too, are in demand. Probably the greatest employers of salesmen, so called, are the firms that try to flood the country with articles of wearing apparel, household appliances, kitchen utensils, laundry supplies and soaps, fruit extracts, novelties of various kinds, books either single or in sets, and insurance of all sorts. Many of these salesmen have had no training for this kind of work at all, and most of them are working on a straight commission which is pitifully small compared to the energy and effort required to make the sales. Is this the type of salesmanship referred to? If so, vocational education would hardly be interested in training workers for it. Legitimate salesmanship, of course, is a subject that cannot be ignored by the schools, but again, business must cooperate with the schools in formulating the right kind of courses.

It is deplored also that "the workers lack the willingness to learn." The head of a vocational school in the east showed that in his bench-hand's class, die-cutting class, and toolmaking class, he has a total enrollment of 50, with equipment and working stations provided for only 33. The evening classes in this same school had to turn away about as many applicants as they could accept, because of the lack of room and equipment.

This is not an isolated instance. Many city schools are in the same predicament. The fact is, workers *do* want to learn if opportunity is given them to learn something worth while.

From the foregoing it is quite plain that vocational education has on its hands a serious job of first educating business and industry, and then in educating the youth of America. But this requires the cooperation of all if the work is to be done well. It may be well if education take a leaf out of the books of some of the business leaders who appear at educational conventions to decry our efforts, to appear before them and with equally blunt phrases, but with more logic, show them not only what their shortcomings are, but how these may be overcome.

It is always good to listen to criticism, even if that criticism may not be constructive, because out of it can be drawn direction finders for greater improvement. It is not so good, however, to let all statements that are not based on truth go unchallenged. Vocational education and its fellow, industrial-arts education, must continually be on the alert to keep on improving their work. Closer contact must be our constant aim with parents, community, labor, employer, business, and industry. Better acquaintance will undoubtedly produce better understanding, greater cooperation, less unfair criticism, and it is to be hoped, a wholehearted working together on the big and important task of preparing the young to be better Americans than we, the older generation, have evidently been.

What Has Been Accomplished?

The end of the first semester of the school year 1939–40 is fast approaching. Again the shop teacher is afforded an opportunity to study how he has affected the youthful minds who came to him at the opening of school.

He will find some who have been very successful with the practical work which he has given them. Others have done better with the technical and related work of the shop course. Still others have done well or failed in both. What has been the cause? Probably tests will disclose whether too much emphasis was given to one phase or to the other.

But there are other more important questions — how have the students been affected individually as human beings? Has the teacher's influence made them better than they were when they enrolled in his class? Have they become more cooperative, better members of the school body, more agreeable at home, better citizens?

While the teacher may not find satisfactory answers to all of these questions, nevertheless, he will do a better job next semester for having delved into them.

Glossary of Architectural Terms

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To the student beginning a study of architectural drafting comes a confusing array of technical terms peculiar to the field of architecture. Texts and other instructional material which he uses during his first weeks of elementary study make free use of technical terms but rarely devote much space to the discussion or clarification of their meanings. It usually follows that the student becomes confused in his understanding of the work. Frequently this lack of understanding is followed by a gradual but discernable lessening of his interest in the field of architecture.

The following glossary of architectural terms has been found useful as a supplement to the usual text materials in clearing the student's confusion. It was compiled over a period of several semesters. When a technical term came to a student's attention and its meaning could not be readily ascertained through study of available instructional material, the word, together with its definition, was added to the list. In this manner the glossary grew to its present length.

alcove — A recessed room connected with a larger room by an archway.

anchor — One of the iron bolts embedded in the foundation by means of which the superstructure is rigidly bolted to the foundation.

angle iron — A structural steel bar having a 90 degree L-shaped section.

arch — A convexly curved vertical span of steel, stone, concrete, or wood.

architect — One versed in the various styles of architecture and proficient in the art of designing and planning buildings.

architrave — A trim around interior doors and windows.

archway — An opening or passageway beneath an arch or vaulted ceiling.

areaway — An open-walled space below ground level outside a basement door or window.

asbestos — A noninflammable mineral compound used for insulation and roofing.

ashlar — Cut stone laid in regular or even courses.

asphalt — A compact bituminous compound used for roofing and other building purposes.

attic — The space, usually unfinished, between top floor ceiling and roof.

axis — A line about which an object may revolve or upon which an area is centered.

back filling — Filling of coarse gravel and broken stones on outside of basement wall or foundation to insure proper drainage.

backing brick — That part of a brick wall which lies back of the face brick.

balcony — A railed platform projecting from the interior or exterior walls of a building somewhat above the floor or ground level.

baluster — A small column supporting the handrail of a stair.

barge board — A wide trim board placed on the ends of a gable roof.

baseboard — A board skirting the walls of a room at the floor line.

basement — Portion of a building below ground floor which is finished and has windows admitting air and sunlight.

bat — A portion of a brick which has been broken off.

batten — Shaped flat strip of wood used for finishing and paneling purposes.

bay — Area between two roof trusses.

bay window — A group of windows projecting from the main wall of a building.

beam — A load-bearing structural member supported at both ends.

beam ceiling — A ceiling with horizontal projections representing beams.

bearing wall — A wall which transfers roof and floor loads to the footing of a building.

bed plate — A metal plate which supports structural members.

belt course — A horizontal course of stone or brick projecting slightly from the main wall usually on the sill line.

bevel — A surface cut at an angle other than 90 degrees.

bid — An offer to do a stated amount of work at a certain price.

blinds — A device used to keep out light at windows. An interior shutter.

blueprint — A drawing reproduced on sensitized paper by exposure to strong light through an overlaying tracing.

bond — (1) Joining of two structural members. (2) A method of laying up brick.

brace — A connection between structural members to increase structural strength.

brace frame — A method of heavy house framing commonly used in the eastern states.

bracket — A structural projection from a wall to support weight.

bridging — A system of bracing between structural members to increase rigidity and strength.

bulkhead — Enclosed area beneath a store display window.

buttered joint — A masonry joint made by placing a small quantity of mortar on all edges of a brick and laying it without benefit of a mortar bed.

buttress — Projecting support built against a wall to assist in resisting lateral thrust and roof loads.

caisson — A large, waterproof casing in which work is performed below water surface.

cabinet — Enclosed shelves and drawers in the interior of a building.

canopy — A small, ornamental roof projection over a window or exterior door.

casement — A window sash with hinges on the side.

casing — The metal or wood trim around door or window openings.

cellar — An unfinished excavation under a building.

celotex — Flat sheets of insulating material made of cane fiber.

ceiling — The interior side of the roof of a room.

cement — A substance resulting from the fusion of limestone, shale, and gypsum which is mixed with water as a binder for the sand and crushed rock to form concrete.

clapboard — A thin, narrow board, used for the covering of the sides of frame buildings.

A fine bit of related-instruction material for the architectural-drafting room.

closure — The fraction of a brick required to close the end of a course.

coalesce — To grow together, bind, or to unite.

competitor — One who is a rival of others in submitting bids on a piece of work.

component parts — Elements of a structure which serve or assist other parts of the same structure.

concentric — Having a common center.

contractor — One who agrees to supply materials or erect structures for a stated sum.

cooler — Enclosed shelving through which outside air currents pass for cooling purposes.

coping — The top capping or covering of a wall.

corbel — A projection from a supporting wall between floors, designed as a fire stop and a support for joists.

cornice — An ornamental projection at the top of a wall.

corridor — A wide hallway or passageway in a building.

course — A horizontal continuous layer brick, stone or terra cotta in a building wall.

court — An open space surrounded on three or four of its sides by the walls of a building.

deadening — Soundproofing of building walls by the application of insulating materials.

dimension shingles — Shingles which are uniform in size.

divided light — A window made up of small panes of glass.

dome — An inverted cup-shaped roof.

dormer — The window in a small gable projecting from a sloping roof.

dormitory — A large room or building used for sleeping purposes.

double-acting door — A door which swings both ways.

double hung — A weighted sash so arranged that one part of the sash slides up and the other part slides down.

dowel — A small piece of wood or steel which assists in holding two structural members together.

dumb-waiter — A small, boxlike elevator used to carry materials between floors.

duntile — A manufactured clay building block.

eave — The lower edge of a roof which projects over the exterior walls.

elevation — (1) An exterior vertical view of a building. (2) The relative height above sea level.

ell — A wing which joins the main structure in the form of an L.

estimating — The procedure of analyzing or determining the cost of a structure before its erection.

excavation — Removal of earth to allow construction of basement walls or foundation.

façade — The main front of a building.

fascia — The facing which covers exposed rafter ends at the eaves.
fire wall — An interior wall of fire-resisting materials to prevent the spread of fire.
flashing — Metal strips placed around roof openings to insure the exclusion of water.
flat roof — A roof with a pitch just sufficient to carry off water.
flight — A stairway between two landings.
flue — A passageway for the conveyance of smoke and gases to the outside of a building.
flush — In the same plane or surface.
footing — A widened base of the foundation which carries the load or weight of the building to the earth.
foreshorten — Showing a view in the shortened form in which it appears when viewed in a position other than vertical or horizontal.
foundation — The walls of a building below the ground floor.
French doors — A pair of doors made up of small glass window lights.
furring — Strips secured to a brick or stone wall to which the lath is nailed.
gable roof — A roof having an inverted V shape.
gallery — (1) A closed passageway overlooking another part of the building or an adjacent court. (2) The seating part of an auditorium just under the roof.
gambrel roof — A gable-type roof with its slope on each side of the peak broken into two distinct pitches.
girder — A structural member supported at both ends and designed to carry building loads.
grade — (1) The established finished ground line around a building. (2) The vertical rise per 100 feet horizontal measurement.
grounds — Wooden strips embedded in brick or concrete work for the support of wood finish.
grout — A thin mix of cement and fine sand used in filling cracks or cavities in concrete.
H column — A structural steel member with an H-shaped cross section.
half story — The portion of a house directly under the pitched roof which has a finished floor and ceiling and walls four feet or more high.
handrail — The top rail or piece of a balustrade.
hatchway — The scuttle of trap-door entrance into the attic through the ceiling.
header — (1) A joist set perpendicularly between two other joists. (2) A brick laid with its end showing in the face of the wall.
hearth — The part of the floor in front of a fireplace which is made of heat- and fire-resisting material.
hip roof — A peaked roof having the same pitch on all sides.
I beam — A structural steel member with an I-shaped cross section.
incinerator — A receptacle in which refuse is placed for burning.
insulator — A material not readily conducting heat, cold, or electricity.
joist — Any beam which supports floor or ceiling loads.
kellastone — A stucco finish of magnesite base with a crushed-rock finish.
lath — Wood strips or metal sheets which are applied to studding or furring strips as a foundation for interior plaster.
landing — The floor at the top of a flight of stairs.
laundry chute — An enclosed chute from the upper floors to the basement used for the disposal of laundry.
lavatory — A bathroom washbowl, or a room equipped with such a washbowl.
lean-to roof — A roof sloping in one direction and supported at its upper side by an adjacent building wall.
ledge — A horizontal projection from a building wall.
light — A pane of glass in a door or window.
lintel — An angle iron or wooden beam placed above a door or window opening as a support for the masonry above the opening.
lobby — A room at the entrance of a theater, hotel, or office building which is open to the public.
louvre — A ventilator with slates inclined so as to keep out rain and snow.
mansard roof — A roof having four sides with the same pitch and a flat deck.
mantel — The shelf projection or recessed opening above an open fireplace.
masonry — A structural mass built up of brick or stone with a binding of mortar.
mezzanine — A low story between two major floors of a building, usually with a balcony facing out on the lower of the two major floors.
millwork — Doors, windows, trim, and other portions of a building not cut and assembled on the site.
mortar — A mixture of lime, cement, sand, and water used as a binder for brickwork, stonework, or other like materials.
mullions — Vertical wood or metal bars between windows or window lights.
newel post — The post at the top or bottom of a stairway which supports the ends of the handrail.
nogging — A tier of bricks set in between roof rafters to prevent the weather from entering the attic.
nosing — Front edge of a stair tread which projects over the riser.
orientation — The placing of a dwelling upon the lots with reference to sunlight, view, and immediate surroundings.
parapet — The low wall along the top edge of a platform or roof.
parquet — The portion of a theater floor just behind the orchestra pit.
partition — The wall which separates two rooms.
party wall — A single wall which supports floor and roof loads of two adjacent buildings.
pebble dash — A rough-surface wall finish used on stucco or plaster.
pent roof — A roof with a slant in one direction only.
pew — A continuous seat used in church auditoriums.
picture mold — A molding placed at the ceiling line, or just below, of a room for the purpose of hanging pictures.
pier — A mass of masonry or timber work supporting part of the weight of an arch, bridge, or building.
pilaster — A narrow projection from the main wall of a building which assists in supporting truss or girder loads.
pile — A structural member of metal or wood which is driven into the ground for the purpose of supporting loads.
pin — A wood or metal piece connecting two structural members.
pitch — The slope or slant of a roof which is computed by dividing the center rise of the roof by its span.
plan — A sectional view of a building taken from a horizontal position.
plate — A horizontal structural member which supports vertical structural members.
plate rail — A narrow shelf placed on an interior wall for the purpose of supporting dishes or bric-a-brac.
pointing — The process of filling up the joints between brick or stone in a masonry wall.
post — A vertical, load-supporting member.
profile — Changes in ground-level elevation shown in section.
purlin — A small beam resting lengthwise on trusses and supporting the roof.
rafter — A structural member supporting a building roof.
rail — The horizontal member in the framework of a door frame.
railing — The piece which runs along the top of a balustrade.
reinforced concrete — Concrete reinforced with steel bars which take the tensile stresses.
ribbon board — A brace running lengthwise on the inside of rafters and studding.
ridge — The top edge or peak of a roof.
ridge pole — The structural member forming the ridge of the roof.
rise — (1) The vertical distance between the top of the exterior wall and the peak of the roof. (2) The vertical distance between treads on a stairway.
riser — Upright board forming the face of stair step.
rowlock — A course of brickwork headers laid on edge instead of flat.
rubble masonry — Masonry laid without uniform courses and joints.
sand finish — A wall surface finished with fine sand.
sash — The framework of a window or door which holds the glass.
scratch coat — The first undercoat of plaster applied to a wall.
section — Vertical plan of a structure as it would appear if cut by an intersecting plane.
shakes — Thick, hand-hewn shingles.
sheathing — Lap-joint lumber nailed outside wall studding before the application of building paper and siding.
sheet rock — A flat sheet with a gypsum base and paper face.
sheeting — Boards used as a base on floors, walls, and roofs.
siding — Finish lumber applied on exterior walls.
sill — (1) The bottom part of a door frame or window. (2) Timbers resting on the ground or wood supports which support the superstructure.
site — The location of a building.
skewback — A brick or stone cut to make an inclined surface for receiving the pressure or thrust in an arch.
sleeper — A wooden wall support resting upon the building floor.
skylight — A glassed opening in the roof to admit light.
soffit — The underside of an arch, stairway, or similar structural unit.
soldier course — A course of brick set on end with the brick face exposed.
sole — A rest or platform laid on top of the subfloor as a base for studding.
span — The horizontal spread of a roof between exterior walls.
specifications — A written statement of particulars concerning the quality of materials, the type of construction, and the workmanship involved in the erection of a building.
sprinkler system — An arrangement of pipes and nozzles which automatically sprays water in case of fire.
steeple — A steep, pyramid-shaped roof projection on a building.
stile — The vertical member in a door or window frame.

storm sash — A lightweight glassed window placed outside an ordinary window during the winter season to keep out the cold air.
stack — A vertical pipe arrangement which carries off gases from the interior of a building. Sometimes called a vent.
stool — The part of the window frame on the interior side which rests on and projects slightly over the apron.
stretcher — A brick laid lengthwise of the wall and showing its long, narrow face to the surface.
stucco — A cement finish for exterior walls.
studding — The vertical framework which supports roof loads and to which the wall is secured.
subfloor — Rough flooring laid on top of the floor joists underneath the finish floor.
substructure — That part of the building below the top of the foundation.
superstructure — That part of the building above the foundation.
symbols — Signs, letters, or other characters which, for the sake of shortness, are used to indicate certain fixtures and parts of a building on the plans.
symmetrical — Harmonious, well balanced, proportionate.
T iron — A structural member of steel having a T-shaped section.
terra cotta — A molded, burned clay material used for masonry facing and trim.
throat — The passageway between the open part of a fireplace and the smoke chamber, through which the smoke passes on its way to the chimney.
tie — A connection between two or more structural members.
tile — A molded, burned clay, or cement material used for flooring, facing, walls, and trim.
tower — A part of a building which extends upward from the main structure.
tracing — A drawing made upon translucent cloth or paper.
transom — A sash opening over a doorway.
trap door — A door set in the ceiling or floor.
tread — Horizontal board forming the top of a stair step.
trim — That portion of the finish of a building or room which varies in color, texture, or pattern from the major finish.
trimmers — A member of the framework around openings which is placed parallel to the floor or ceiling joists involved as a support to the header member.
truss — A combination of structural members which carries loads and is supported at each end.
turret — A small tower extending above the main walls of a building.
valley — The intersection line between two roofs.
vault — A ceiling which is arched from all side walls.
vestibule — A small room at the entrance of a building.
voids — Empty or clear spaces in a structure.
wainscot — The wooden facing on the lower portion of a wall.
wall bed — A bed which folds into the wall when not in use.
wallboard — A sheet of fibrous material used on interior walls and ceilings.
water table — A narrow board placed at an angle to the outside of an exterior wall at the bottom of the siding and supported by a wider base. A slight projection of the lower courses of brickwork at the base of a building.
working drawing — Drawings which are sufficiently complete to direct the workman in constructing the object involved without additional instruction from other sources.
wing — A portion of a building which projects from the main structure.
withe — A brick partition separating two flues in a chimney.

Exploitation or Education

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The right and wrong kinds of production jobs in school shops.

It is quite generally known that a large number of school administrators emphasize the importance of printing in the curriculum for its value in producing jobs for the school rather than for the specific and legitimate aims that rightfully belong to the subject. Whether it is a lack of understanding of the true educational values of printing, or selfish reasons on the part of the school heads, we are not sure. Possibly both are contributing factors. The public, if they think of the subject as something more than a fad or frill, generally credit printing as being just another subject in the industrial-arts field, contributing to the needs of general education.

Perhaps the most difficult and the most troublesome problem in any printing program is production. To the layman this simply means the shop is overburdened with the producing of printed forms and publications.

If a school board, an administrator, a supervisor, or teacher, loads up the print shop with production orders, an honest facing of the facts forces the conclusion that it is an unfortunate situation and a remedy must eventually be sought.

Objections to undue emphasis upon production in the school shop might be classified as follows:

Unfair Competition with Commercial Shops

The question arises, when does a school shop actually compete with commercial establishments? What constitutes competition? A school shop becomes a competitor when the type of job is beyond the ability of the learner, when the number of impressions made runs into such high numbers that the work becomes repetitive and tiresome and the acquiring of skill has passed from the picture.

A school shop becomes a competitor when it does jobs that only the instructor has the knowledge and skill to produce. Competition does not enter into the situation as long as the production of printed matter is a means of educating the worker, and the printing jobs used as projects are properly placed on a scale of values so that the learner experiences the jobs in order of their complexity.

When students complain about the drudgery and routine labor of the shop, then production and exploitation are evident to a noticeable degree. When the number of jobs reaches these proportions journeymen printers should man the production load, thus leaving the instruction to the trained teacher.

It is very common to find instructor and student working until late hours at night to complete jobs for school use. This is in addition to the regular workday of six to eight hours in the shop. If a job is so important and so rushing why isn't it worth a standard commercial price? Journeymen printers are paid to deliver jobs to meet consumer demands.

How can the schools expect the endorsement of industry if, in the school work, the spirit of competition instead of cooperation is embodied?

Deflection from Intended Course of Study

One educator says a production order is just a project from another source — and the project method is widely heralded as being admirably adapted especially to vocational education. A production order generally comes from one who is ill-informed on conditions in the shop. In some schools orders are nothing less than demands. If the orders may be worked into the course of study, and the amount governed or regulated by the printing instructor, then the work may serve a very useful purpose. It is well known that students take more interest in a task that serves a useful purpose than in one where a single proof goes into his notebook, and the work is thrown away when completed.

We may say that production printing is more likely to make a potentially competent teacher rather than undo him. With real work to do he has a genuine inspiration to plan and organize.

We contend that the primary purpose of the school print shop is to give sound instruction in the fundamental principles and processes of printing; that to accomplish this purpose, the work of the school print shop must be organized on an instruction basis; that for the practice work of students, actual production jobs are pref-

erable to abstract exercises; that the selection of production jobs must always be made to suit the teaching program and to fill the instruction needs of students; and finally, that the instructor is justified in declining to handle production jobs that do not fit into his teaching program.

There is no other shopwork teacher so imposed upon as the printing teacher. Because the product of the print shop is so usable in the school system, many school officials conceive of their printing departments as fulfilling chiefly the function of production, with instruction as an incidental by-product. This is often the understanding when the teacher is engaged.

To control the situation, the instructor must first of all demonstrate that he has an instruction program. This is exceedingly difficult for the printer who has no teaching experience or who has not had a course in trade teaching in which he has learned how to organize his work. Usually he must struggle along for a few years until he can get his teaching schedule established. In accomplishing his end he must exercise the utmost discretion and diplomacy, else he will lose his job and another printer will be taken out of the trade to do the job printing for the school system with the labor of pupils.

Frequently school officials, and particularly superintendents of schools, are the ones most to blame for this situation. They think they are saving money for the city by getting their printing done in the school shop, but this is a misleading fallacy. Moreover, school superintendents and principals ought to be the most vigilant of all persons in maintaining the instruction function of the print shop as well as of all other school shops. They ought to insist that school-shop activities yield a maximum of instruction value to pupils rather than job-production value to the school system.

Ignoring the Aims of Education

Under this objection may come the various forms of exploitation of pupils. Printing should have a very definite purpose in the school curriculum, and, if properly organized and taught, the product becomes visible evidence of the fine co-ordination of heart, hand, and mind. Education and exploitation do not function as one. A refined type of exploitation may be commonly found in a situation such as that described by Dr. Arthur Dean, a prominent American educator, when he says:

"I draw the line on printing jobs which substitute child labor in school for the very thing which we as a nation are struggling at this present moment to avoid. To print thousands of blanks, sheets, leaflets, cards, records, tickets, forms, and tests which need no originality, exercise no taste, develop no interest in printing as a fine art, express no joy in work, and offer no prevocational experience in real printing, is to kill the goose that lays the golden egg."

Under these conditions the school system is exploiting the children in that it is receiving the taxpayers' support for a service below the plane of efficiency it is supposedly capable of rendering.

To get at the job-production difficulty at its source, two things are necessary. The first is proper education of school officials concerning the function of school shopwork. They should be made to realize that the school print shop is no exception, and that neither teacher nor students should be exploited through any motive of false economy. In the second place, printers should be made to understand that in accepting teaching positions they should do so with their eyes open to the actual facts of the case, and thus be in a better position to insist upon working conditions that make primarily for sound instruction of pupils in the Art Preservative.

Spelling List for the Drafting Room

M. R. Klein

Nathan Hale Junior High School, Cleveland, Ohio

The spelling list of 250 words or terms herewith submitted may be used readily in all drawing classes. It is suggested that the list be mimeographed or printed in the school print shop for distribution. Drawing pupils may refer to the spelling list in connection with their drawing or when taking notes. It helps to reduce misspelled words on drawings and in notebooks and incidentally may aid to increase the vocabulary of industrial-arts pupils.

Related material, useful either in the drafting room, or in the student's English lessons.

1. accuracy
2. Acme thread
3. addendum
4. alphabet
5. alphabet of lines
6. angle
7. Arabic numbers
8. arc
9. architect (*Arch.*)
10. architectural drawing
11. arrowheads
12. assembly drawings
13. auxiliary views
14. axle
15. beam compass
16. bearing
17. bell crank
18. bevel
19. bevel gears
20. bill of material
21. bisect angle
22. blue-line print
23. blueprint
24. bolts
25. bore
26. boss
27. bow pencil
28. broken section
29. bushing
30. buttress thread
31. cabinet drawing
32. calipers, vernier
33. calipers, micrometer
34. calipers, inside
35. calipers, outside
36. cam
37. cap screw
38. centimeter
39. chamfer
40. checker
41. chief draftsman
42. chord
43. circle
44. circumference
45. civil engineer
46. coarse
47. compass
48. composite order (*Arch.*)
49. cone
50. conventional breaks
51. core
52. corinthian order (*Arch.*)
53. cornice (*Arch.*)
54. crosshatching
55. cube
56. cylinder
57. decimals
58. decimal equivalents
59. dedendum
60. degrees
61. designer
62. designing engineer
63. detailer
64. details
65. detail section
66. development
67. diameter
68. diametral pitch
69. dimensions
70. dividers
71. dividers, proportional
72. Doric order (*Arch.*)
73. drawing, architectural
74. drawing, cabinet
75. drawing, isometric
76. drawing, mechanical
77. drawing, oblique
78. drawing, perspective
79. drawing, pictorial
80. drawing, sheet metal
81. drafting
82. draftsman
83. drawing board
84. drawing paper
85. drill
86. elevations
87. ellipse
88. end view
89. equilateral triangle
90. erasing shield
91. extension bar
92. fillet
93. fine thread
94. finish mark
95. fit
96. flange nut
97. floor plan (*Arch.*)
98. footing (*Arch.*)
99. formula
100. foreshortened views
101. foundation (*Arch.*)
102. freehand
103. front elevation
104. front view
105. frustrum
106. full section
107. full size
108. gable (*Arch.*)
109. garage (*Arch.*)
110. gauge, surface
111. geometrical construction
112. gland
113. Gothic (*Arch.*)
114. graphic language
115. half section
116. handbook
117. helical
118. helix
119. hexagon
120. horizontal
121. house plans (*Arch.*)
122. hyperbola
123. inclined lettering
124. inclined surfaces
125. ink, drawing
126. Inking
127. inscribe
128. instruments
129. intersections
130. invisible edges
131. involute
132. involute gear
133. Ionic order (*Arch.*)
134. irregular curve
135. isometric
136. jig
137. joist (*Arch.*)
138. key
139. knurl
140. lag bolt
141. lock nut
142. lower-case letters
143. machine screw
144. materials
145. measurement
146. mechanical engineer
147. mortise
148. needle point
149. notes
150. oblique

151. octagon
152. ogee curve
153. oil groove
154. orthographic projection
155. outlining
156. oval
157. over-all dimensions
158. pantograph
159. parabola
160. parallelogram
161. parallel
162. patent drawing
163. pattern
164. pencils
165. pens, lettering
166. pentagon
167. perpendicular
168. perspective
169. photostat
170. pictorial drawing
171. pinion
172. pipe threads
173. piston
174. pitch circles (diameter)
175. plan
176. plane of projection
177. plumb bob
178. polygon
179. preliminary
180. prisms
181. profile
182. protractor
183. pulley
184. pyramid
185. radial lines
186. radius
187. railway engineer
188. ream
189. revolutions
190. revolved sections
191. rivet
192. Roman letters
193. roof plan (*Arch.*)
194. root diameter
195. rule
196. scale
197. screw threads
198. seams and lap
199. sections
200. segment
201. semicircle
202. set of plans
203. setscrews
204. shade lines
205. sharp V thread
206. sheet metal
207. shrink fit
208. side elevation
209. sketching
210. spacing
211. specifitations
212. square elbow
213. stretchout
214. stud bolt
215. surface
216. surveying
217. symbols
218. symmetrical
219. tables
220. tangent
221. tap
222. technical
223. technique
224. teeth
225. tenon
226. tension
227. threads
228. titles
229. thumb tacks
230. top view
231. tracer
232. tracing cloth
233. tracing paper
234. transition piece
235. triangles
236. T square
237. Tuscan order (*Arch.*)
238. U. S. Standard
239. valve
240. vellum
241. vertical lettering
242. vertical plane
243. views
244. washer
245. wheel
246. wood screws
247. working drawing
248. worm
249. worm gear
250. yardstick

Functional Method of Teaching Mechanical Drawing

Clemens Nicholas

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The steady and rapid increase in industrial processes and the adoption of mechanical equipment and devices have necessitated a corresponding increase in technical knowledge and skill. Mechanical drawing has played an important part in this development. As machines and manufacturing methods become more complex and refined, the drawings from which they are evolved require greater precision, accuracy, and understanding, in their making as well as in their uses. Whether considered as a valuable subject in general education, or as an essential pre-engineering subject, or as an occupational course in the terminal trade and vocational schools, the increasing importance of mechanical drawing as a secondary-school subject warrants serious study and discussion of better teaching methods.

We may assume that mechanical drawing is the universal language of our industrial life and, somewhat in the manner of the teaching of languages, the pupil is to be taught both to read and to write. This is true notwithstanding any differences of opinion regarding the real or fancied objectives of teaching this subject. Any differences in objectives between those educators who consider mechanical drawing as having its real importance as a cultural subject and those who regard it as having also an occupational implication, result mainly in a variation of details of teaching order or of a distribution of emphasis.

Course Content

The substance or content of mechanical-drawing courses may be broken down into the following five basic elements:

1. *Manipulative Skills:*

Proper and facile use of the T square, triangles, and instruments; craftsmanship in making precise lines of proper weight in pencil and ink drawing and tracing; lettering, and the like.

2. *Geometry:*

Theoretical and empirical geometrical construction, dividing lines and angles, drawing tangents to circles, finding perpendiculars, etc.; geometrical devices used in intersections and developments, etc.

3. *Thinking in Three Dimensions:*

Descriptive geometry in theory and in its practical application such as orthographic projections, pictorial drawings, sections, conceptions such as that of the true length of a line in developments, conceptions of intersections in three dimensions, understanding of mechanical movements such as cams and gears, development of imagination and creative thinking.

4. *Symbols, Nomenclature:*

Materials and drawing symbols and notations, dimensioning methods, scales, and the like.

5. *Materials:*

Their uses and limitations; methods of manufacture, construction, and assembly, etc.

The list of items under these headings is by no means complete, they are merely suggestive. However, these five essential elements constitute the material which can best be offered the pupil in the drafting room. Other technical subjects which are necessary in the training of the more advanced pupils such as mathematics, physics, mechanics, and ultimately some engineering, are best taught in the classroom.

Under different teaching methods, the five basic elements are presented with variations in combinations, sequence, and emphasis. As a general rule, there follows, after training in simple skills and elementary drafting-board geometry, an early introduction to the problems of orthographic projections along with the elements of symbols and materials. Then follows a progression and development in various phases of all these elements. In drafting classes as generally conducted today, the pupil is taught to write, read, and understand simultaneously throughout the course.

The value of teaching blueprint reading before the student takes up the study of drafting.

Manipulative Skills and Geometry

"Mechanical drawing involves relatively few manipulative skills; but a high degree of proficiency is required in them in order that the drawing may present a good appearance."* It might be added that such proficiency is necessary, not only for appearance, but for the actual execution of any drawing beyond those that are rather simple.

The understanding of abstract geometry required by the draftsman is considerable and it must be clear and precise. The geometrical devices and tricks he depends on are many and intricate. This understanding and facility are essential for the execution of a drawing of any difficulty whatsoever.

Assuming this to be true, the pupil's progress in execution in mechanical drawing is dependent on and concurrent with his acquisition of manipulative skills, and his understanding of geometrical principles as applied in drawing.

A New Approach

Granting this, let us consider the effect of postponing the pupil's training in skill

*Standards of Attainments in Industrial Arts, 1935.

and applied geometry and of giving him first a well-grounded understanding of drawings. In other words, let him learn to read drawings, know and understand them, and then learn to make them. After an experimental development, which came about partly by design and partly by chance, this is essentially the method of teaching mechanical drawing in use for the past five years at the Hadley Vocational School, St. Louis, Mo., with rather interesting and important results.

In the introductory ninth-grade course, in complement to the shopwork, one term (five 45-minute periods per week) of blueprint reading is given, followed by a term of shop sketching (five 45-minute periods per week). Architectural drawing and machine drawing are major courses in drafting in grades ten, eleven, and twelve. In these grades, mechanical drawing or shop sketching are also given as related subjects for the major shop courses.

The first term of blueprint reading is devoted entirely to the reading and interpretation of drawings. Since the pupil does no drawing in this work, his progress in understanding is not dependent on training in skill nor on a knowledge of drafting-board geometry. He can concentrate on the cultivation of a three-dimensional conception of an object, pictorially and in the conventional views. He becomes familiar with the relation of surfaces and the lines which represent them in the various views. He acquires a familiarity with symbols, notations, materials, and construction and assembly methods. He learns the grammar, rhetoric, and meaning of involved industrial drawings. He has fixed in his mind by repetition, proper lettering forms, dimensioning methods, arrangement of views, and many other drafting practices which are required slowly by the usual method of teaching drawing.

During the second term the pupil has an opportunity, in the shop-sketching course, to put into practice much of what he has acquired while learning to read drawings. Since this work is done mostly freehand, the only instrument being a rule, it forms a transition from the reading to the execution of mechanical drawings. This is a valuable type of training which should be cultivated more but which is generally neglected in mechanical-drawing courses.

With this introductory work as a foundation, the pupil begins his actual training in instrument work. He can concentrate more easily on the acquisition of manipulative skills and drafting-board geometry. He is not confused by having to master too many elements of his subject at one time. Since the successive phases of his learning are simplified and better arranged and oriented, he is more thoroughly grounded and progresses more rapidly.

Checking Results

After several years of this program, it was obvious that in general the mechanical-drawing pupils with the background of blueprint reading and shop sketching, had a more intelligent and definite understanding of the subject, and the quality of their drawing showed a superiority in comparison with the work of those who did not have the introductory work.

Our drafting classes are not always homogeneous in classification nor with regard to the previous training of the pupil. For this and various other reasons, standard tests for achievement in mechanical drawing were not considered sufficiently valid for checking purposes. To check on our observations, we made a survey of the grades given over a period of years for corresponding groups. For example, the average grades of a group which had one term of blueprint reading, one term of shop sketching, and two terms of mechanical drawing, were compared with the average grades of a group which had two terms of shop sketching and two terms of mechanical drawing. In each set of groups compared, the total amount of time devoted to the general subject of mechanical drawing was the same.

The grades used in the survey were given by eight instructors. Of the fifteen comparisons made, thirteen of the groups with the introductory blueprint reading had higher grades. It is also interesting to observe that as a whole, these groups averaged 80.7 per cent as against 77.2 per cent, a superiority of 3.5 per cent. While this difference is not spectacular, it is consistent and does substantiate the conclusions of the mechanical-drawing instructors. We believe it is definitely suggestive of an improvement in the technique of teaching mechanical drawing.

Logically the question arises as to how much time can be taken profitably from actual instrument and T-square work and devoted to blueprint reading and shop sketching. Since our mechanical-drawing pupils have three years of instrument work for a total of 1,500 clock hours, we believe that 150 clock hours of the ninth year is not too much time to devote to the introductory work. Perhaps in a two- or three-year mechanical-drawing course, one-half year would suffice for the reading and sketching. This allotment of time can be determined only by considerable experiment and checking.

Comparison of Mechanical-Drawing Grades

Groups with Blueprint Reading, Term 1, and Shop Sketching, Term 2, followed by Mechanical Drawing		Groups with Shop Sketching, Terms 1 and 2, followed by Mechanical Drawing	
Number of Pupils	*Average Grades*	*Number of Pupils*	*Average Grades*
Machine and Architectural Drafting, Terms 3, 4, 5			
22	81.6	11	79.1
3	76.7	3	78.3
4	87.5	7	84.7
Electricians — Related Drafting, Term 3			
7	79.3	15	74.3
11	80.9	2	65.0
17	79.1	11	76.3
Introductory Metal Trades — Related Drafting, Term 3			
26	79.4	17	74.1
Machinists — Related Drafting, Term 4			
11	82.7	3	81.6
19	80.3	16	78.1
5	83.0	2	77.5
12	80.8	9	78.9
4	82.5	16	75.6
Machinists — Related Drafting, Term 5			
20	80.3	23	76.5
Machinists — Related Drafting, Term 6			
14	80.4	11	77.7
Machinists — Related Drafting, Term 7			
12	81.3	9	82.8
Total Number of Pupils	*Total Average*	*Total Number of Pupils*	*Total Average*
187	80.7	155	77.2

Additional Advantages

This program offers other advantages. The largest number of dropouts occur in the ninth year. These pupils who stay in school for one year only will generally profit more, in a practical way, from training in reading industrial drawings and in making sketches than they would from the meager experience of one year of mechanical drawing.

Shopwork and mechanical drawing are complementary subjects although they are

not always correlated in the school program. The pupil has an early need in his shopwork for skill in reading blueprints and frequently for the making of simple sketches. One or two terms of elementary mechanical drawing do not provide for this need as adequately as the proposed introductory work.

The substitution of the introductory reading and sketching for the equivalent instrument work effects a very considerable economy. Assuming a like cost for textbooks and problem material, the difference lies in the cost of supplies and equipment. The annual cost per pupil for supplies for the introductory work is very much less than that for the instrument work.

An Analogy

Some time after arriving at the conclusions stated in the foregoing, our attention was directed to the work of Mr. Louis A. Leslie who developed the Functional Method of Teaching Shorthand. Mr. Leslie found that a brief period of teaching reading and understanding of shorthand afforded a considerable familiarity with correct shapes and meaning of symbols. This reading period when followed by training in writing and reading shorthand was conducive to a remarkable progress in the subject. In the introduction to his book, *The Teaching of Gregg Shorthand by the Functional Method*, Mr. Leslie evolves the principles on which his method is based, and makes some interesting comparisons with the teaching of languages.

The analogy between the principles and results of Mr. Leslie's method and ours is significant. Since shorthand involves basically manual dexterity, the logic explaining these methods should be even more applicable to the teaching of mechanical drawing. Manipulative facility in drafting, while of a high order, is a relatively small factor in the competence of the draftsman. The curve of manipulative skill reaches a plateau fairly early in training and ultimately must involve the factor of speed. However, skill and speed in mechanical drawing are both dependent on a well-grounded knowledge, a faculty for precise and logical thinking, and a cultivated imagination and ingenuity. These aspects of mechanical drawing constitute the challenge and absorbing interest which so many pupils find in this subject as a school experience.

Even though on an elementary basis, an early introduction to a thorough and sound understanding of principles before an attempt is made at execution, is a proper procedure. The pupil knows what he is trying to do, why, and how; he will then work with confidence and his development will be thorough and rapid.

Silent and Sound Films for Use in Industrial Arts

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Junior High School,
Washington, Iowa

Sources of 16-mm. films that may be useful to teachers of industrial arts and vocational education.

Visual aids have long been a part of most industrial-arts teacher's teaching equipment. He uses them for stimulating interest in new areas and as instructional aids. One type of visual education is not used so often and that is the motion picture. There are but few motion pictures, either silent or sound films, that deal with specific skills. However, there is a wealth of new films dealing with many phases of industry that many teachers of industrial subjects will want to secure for use in their various classes.

In this article are listed a number of 16-mm. films related to the various areas usually covered by the modern industrial-arts programs in our high schools. The information given includes the title of the film, its length and cost, and the key reference to the name and address of the distributor.* Wherever a film has been listed as free, it must be understood that the teacher or school using the film pays the transportation expense both ways.

In order to secure the desired films for use, it is a good plan to book the films at least a month or two in advance. This procedure makes it possible for the teacher

*The full names and addresses of the distributors are given at the end of this article.

Films Suitable for the Wood Area

Title	*Length*	*Sound or Silent*	*Cost*	*Distributor*
Trees and Men	44 min.	sound	free	YMCA
Harvesting the Western Pines	3 reels	sound	free	YMCA
ABC of Forestry	1 reel	silent	free	YMCA
Timber-r-r	1 reel	silent	rental	Univ. Calif.
Romance of Mahogany	45 min.	silent	free	MAI
Masterpieces in Mahogany	30 min.	silent	free	MAI
New Woods for Old	2 reels	silent	free	Univ. Wis.
Operation of a Forest Nursery	1 reel	sound	free	Univ. Wis.
Forest Treasures	25 min.	sound	25c rental	Annis
Conquest of the Forest	1 reel	sound and silent	free	Gen. Elec. Co.
Woodworking	1,000 ft.	silent	free	DeWalt

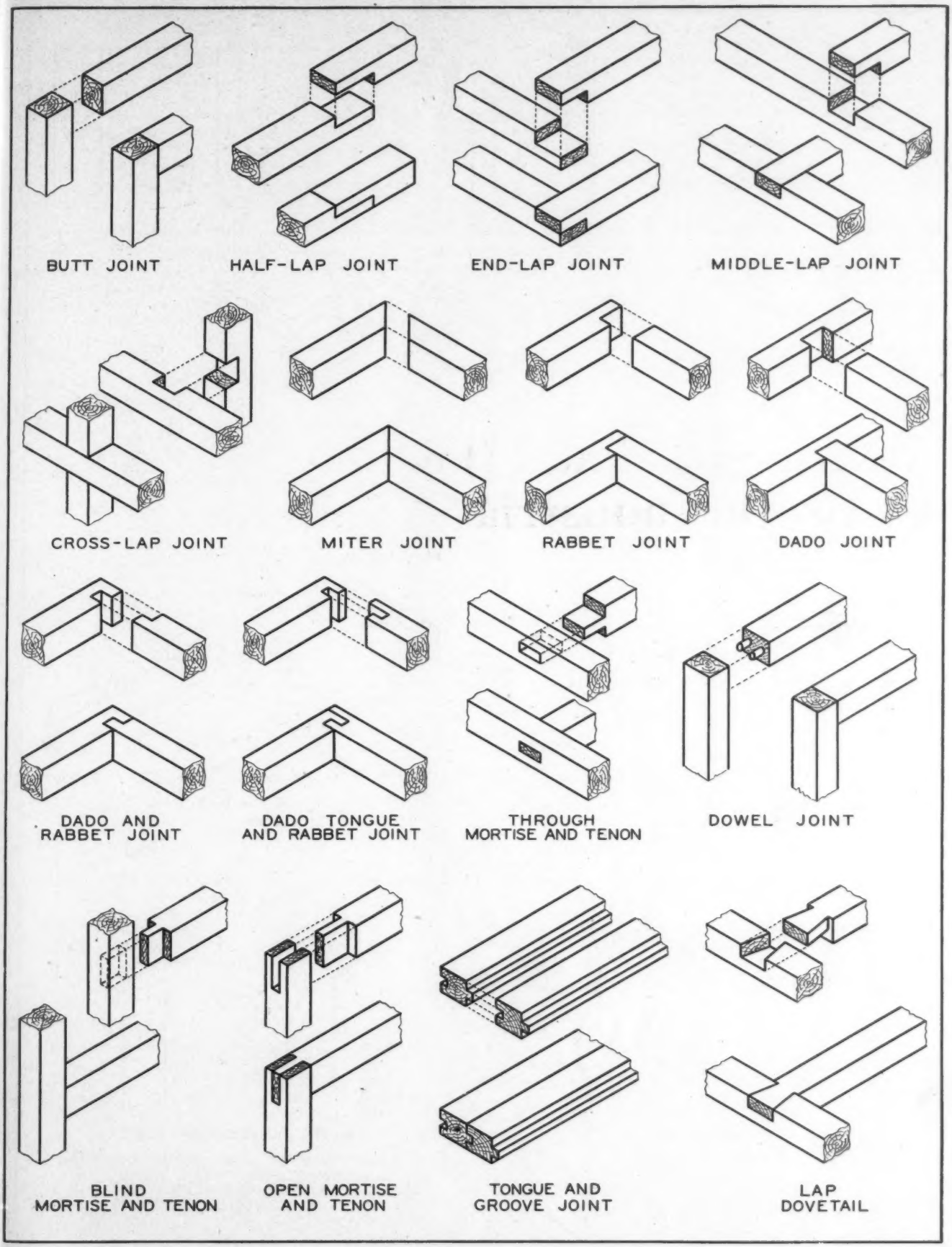
Films Related to Industrial Fields

Title	*Length*	*Sound or Silent*	*Cost*	*Distributor*
Boulder Dam	1,600 ft.	sound	$1.05	Univ. Ia.
How Writing Paper is Made	2 reels	silent	70 cents	Univ. Ia.
Building of Boulder Dam	10 min.	sound	rental	Univ. Okla.
Oxwelding in Production	2 reels	silent	rental	Univ. Okla.
Bridging San Francisco Bay	40 min.	sound	rental	U. S. Steel
Spinning Spokes (bicycles)	18 min.	silent	rental, $1	Bell & H.
Making of Safety Glass	14 min.	sound	free	Ford
Safety Glass	34 min.	silent	free	USBM
Story of the Hacksaw	2 reels	silent	free	Atkins
Serpents Tooth on Hand Saw	1 reel	silent	free	Atkins
Metier (Crosscuts)	2 reels	silent	free	Atkins
Diesel — the Modern Power	20 min.	sound	free	YMCA
Voice of Business	2 or 3 reels	silent	free	Hammermill
The World of Paper	2 reels	silent	free	Gen. Elec. Co.
Conquest of the Hudson	22 min.	silent	rental	Amer. Museum
Construction of George Washington Bridge	15 min.	silent	rental	Amer. Museum
Mountains of Marble	22 min.	sound	free	Vermont

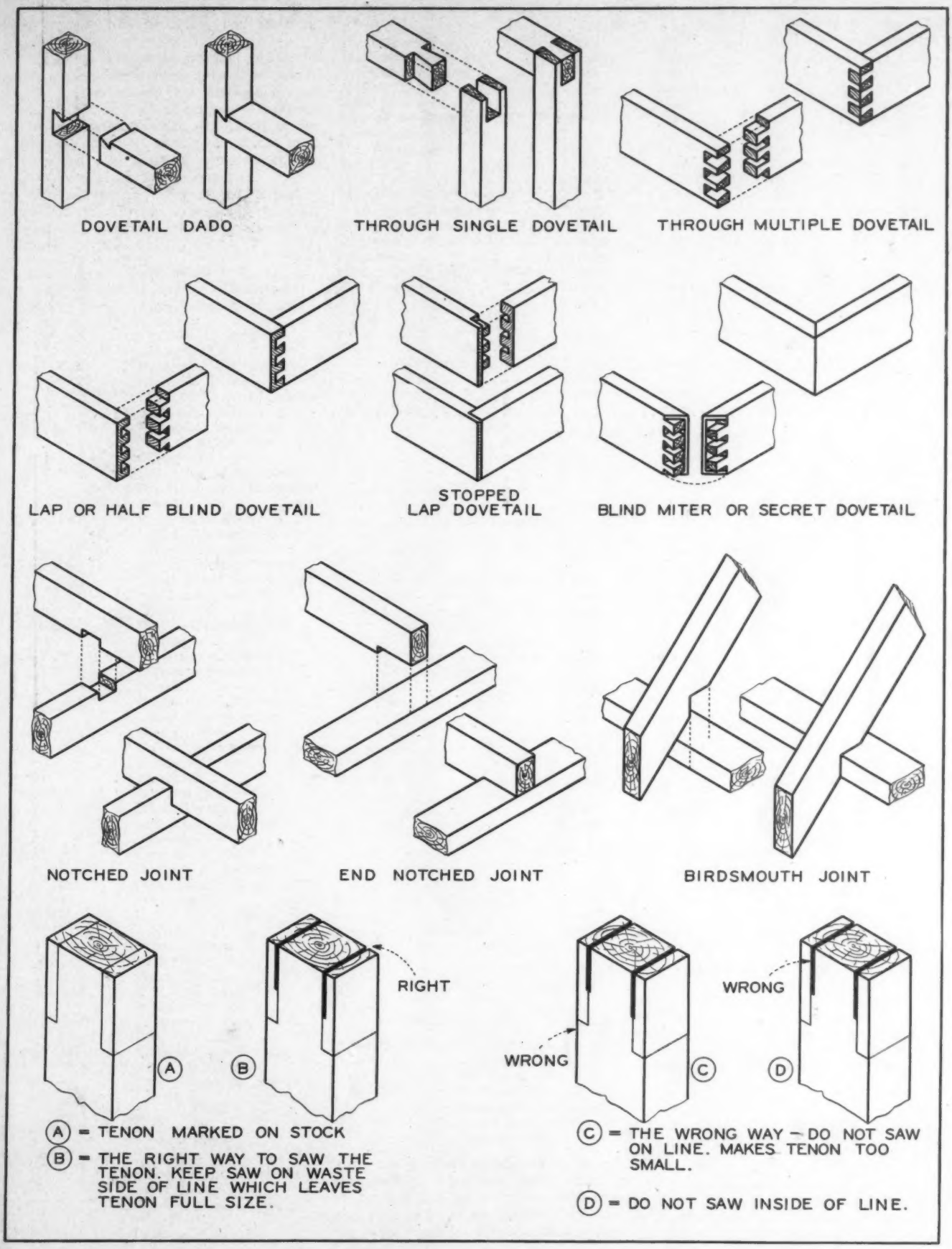
Films Suitable for the Electrical Area

Title	*Length*	*Sound or Silent*	*Cost*	*Distributor*
The Zephyr	1 reel	silent and sound	free	Gen. Elec. Co.
The Story of Thomas Edison	1 reel	silent and sound	free	Gen. Elec. Co.

(Please turn to page 67)



Woodworking joints, see page 68


DOVETAIL DADO
THROUGH SINGLE DOVETAIL
THROUGH MULTIPLE DOVETAIL
LAP OR HALF BLIND DOVETAIL
STOPPED LAP DOVETAIL
BLIND MITER OR SECRET DOVETAIL
NOTCHED JOINT
END NOTCHED JOINT
BIRDSMOUTH JOINT
A
B
RIGHT
WRONG
C
WRONG
D
(A) = TENON MARKED ON STOCK
(B) = THE RIGHT WAY TO SAW THE TENON. KEEP SAW ON WASTE SIDE OF LINE WHICH LEAVES TENON FULL SIZE.
(C) = THE WRONG WAY — DO NOT SAW ON LINE. MAKES TENON TOO SMALL.
(D) = DO NOT SAW INSIDE OF LINE.

Woodworking joints, see page 68

(Continued from page 62)

to get the film he wants just when he wants it.

Most of the modern sound projectors will project silent films as well as sound. The teacher should not attempt to run sound film in a silent projector, however, for the sprocket wheel will damage the film and make it expensive for the user. Damaged film must be replaced by the school or person who damages it.

The list which follows is only a partial one, but it will help to supply a long-felt need of industrial-arts teachers as to sources of films.

Distributors

Code	*Address of Distributors*
YMCA	YMCA Motion Picture Bureau 19 South La Salle St. Chicago, Ill.
Univ. Calif.	University of California Extension Division Dept. of Visual Instruction Berkeley, Calif.
MAI	Mahogany Association, Inc. 75 E. Wacker Drive Chicago, Ill.
Univ. Wis.	University of Wisconsin Bureau of Visual Instruction Madison, Wis.
Annis	R. B. Annis Company 1505 E. Michigan St. Indianapolis, Ind.
Gen. Elec. Co.	General Electric Company Visual Instruction Section 230 South Clark St. Chicago, Ill.
DeWalt	DeWalt Products Corp. Lancaster, Pa.
Univ. Ia.	University of Iowa Extension Division Iowa City, Iowa
Univ. Okla.	University of Oklahoma Visual Education Dept. Norman, Okla.
U. S. Steel	United States Steel Corp. 436 Seventh Ave. Pittsburgh, Pa.
Bell & H.	Bell and Howell Co. Films Division 1801 Larchmont Ave. Chicago, Ill.
Ford	Ford Motor Co. Dept. of Photography 3674 Schaefer Road Dearborn, Mich.
USBM	United States Bureau of Mines Graphic Section 4800 Forbes St. Pittsburgh, Pa.
Atkins	E. C. Atkins Co. Indianapolis, Ind.
Hammermill	Hammermill Paper Co. Erie, Pa.
Amer. Museum	American Museum of Natural History 77th St. and Central Park West New York, N. Y.
Vermont	Vermont Marble Co. Proctor, Vt.
Ia. State	Iowa State College Visual Instruction Service Ames, Iowa
Bell	Bell Telephone Company (local)
Univ. Ga.	Division of General Extension University System of Georgia 223 Walton St., N.W. Atlanta, Ga.
Amer. Brass	American Brass Co. Department "D" Waterbury, Conn.
Pitts. PGC	Pittsburgh Plate Glass Co. Rennous-Kleinle Division Carroll Station P.O. Baltimore, Md.

Title	*Length*	*Sound or Silent*	*Cost*	*Distributor*
The Conductor	1 reel	silent	free	Gen. Elec. Co.
The Busy Body	1 reel	silent	free	Gen. Elec. Co.
Queen of the Waves	1 reel	silent	free	Gen. Elec. Co.
Modern Zeus	1 reel	sound	free	Gen. Elec. Co.
Light of a Race	1 reel	silent	free	Gen. Elec. Co.
King of the Rails	1 reel	silent	free	Gen. Elec. Co.
Hydro Electric Power	1 reel	silent	free	Gen. Elec. Co.
The Benefactor	1 reel	silent	free	Gen. Elec. Co.
Big Deeds	1 reel	silent	free	Gen. Elec. Co.
Light for Living	40 min.	sound	free	Gen. Elec. Co.
Making of Mazda Lamps	2 reels	silent	free	Gen. Elec. Co.
Wizardry of Wireless	2 reels	silent	free	Gen. Elec. Co.
Principles of Magnetism	2 reels	silent	$2.00	Univ. Ia.
Principles of Electrostatics	2 reels	silent	$2.00	Univ. Ia.
Electrons	10 min.	sound	$1.50	Ia. State
Heat and Light from Electricity	1 reel	silent	$1.00	Ia. State
Sky Harbor	1 reel	sound	free	YMCA
New Voice Highways	1 reel	sound	free	YMCA
Communications News and Views — Series IV	11 min.	sound	free	Bell
Communications News and Views — Series II	11 min.	sound	free	Bell
Voices in Paper	1 reel	sound	free	Bell
Voices in the Air	1 reel	sound	free	Bell
Safeguarding the Speechways	2 reels	sound	free	Bell

Films Suitable for the Metal Area

Title	*Length*	*Sound or Silent*	*Cost*	*Distributor*
Aluminum-Fabricating Processes	2 reels	silent	$1.00	Ia. State
Copper Leaching and Concentration	1 reel	silent	35 cents	Univ. Ia.
Copper Smelting	1 reel	silent	35 cents	Univ. Ia.
Copper Refining	1 reel	silent	35 cents	Univ. Ia.
The Metals of a Motor Car	2 reels	silent	70 cents	Univ. Ia.
Manufactured Abrasives	3 reels	silent	free	USBM
Fabrication of Copper	3 reels	silent	free	USBM
Story of Lead Smelting	3 reels	silent	free	USBM
Story of Steel — Manufacture of Steel Sheet and Tin Plate	1 reel	silent	free	USBM
Steel — A Symphony of Industry	20 min.	sound	rental, $1	Univ. Ga.
Metal Craft	11 min.	sound	rental, $2	Univ. Ga.
Pottery Making	11 min.	sound	rental, $2	Univ. Ga.
Plastic Art	11 min.	sound	rental, $2	Univ. Ga.
The Machine Maker	11 min.	sound	rental, $2	Univ. Ga.
Making Craftsmen	11 min.	sound	rental, $1	Univ. Ga.
The Builders	22 min.	sound	rental, $3.50	Univ. Ga.
Manufacture of Anaconda Sheet Copper	1 reel	silent	free	Amer. Brass
From Mine to Consumer	2 reels	silent	free	Amer. Brass

Films Suitable for the Finishing Area

Title	*Length*	*Sound or Silent*	*Cost*	*Distributor*
Science Saves the Surface	20 min.	sound	free	YMCA
Lead	1 reel	silent	$1.00	Univ. Ia.
Manufacture of Brushes	3 reels	silent	free	Pitts. PGC

In a democracy society must recognize that the individual has rights which are guaranteed, and the individual must recognize that he has responsibilities which are not to be evaded. — *Dr. Harry Woodburn Chase.*

THOUGHTS FOR THE DAY

Lewis H. Hodges,
Grand Haven, Michigan

(Continued from page 32, January issue, 1940)

Money was once considered the barometer of a man's success, but today *service* is the thermometer indicating whether he will be received coldly or not.

* * * *

To avoid unkind criticism, *Say* nothing, *Be* nothing, *Do* nothing.

* * * *

I once steered a raft down the Mississippi River. It went along delightfully with the current: But I didn't meet any rafts going upstream — they were all steamboats. — *Lincoln.*

The best steel is that which has undergone the hardest pounding.

* * * *

A man is a slave until he *thinks* and then he is a *master*.

* * * *

Saith the owl: As a general rule, the chap who is "not going anywhere in particular" usually gets there.

* * * *

Cultivate mental concentration; any man who cannot swarm will gather little honey. — *Uncle Philander.*

* * * *

Weeds will come without invitation
Roses grow wild without attention
But —
I'll be hanged if one can raise a yield of *potatoes* without the use of a hoe!

* * * *

Industry is a three-legged stool — *capital, labor,* and *management*. Take away any one of these legs and the stool cannot stand.

Trifles make perfection *but* perfection is no trifle.

* * * *

Fortune may knock at your door, but don't expect her to use a battering ram.

* * * *

No one who has ever tried to earn it, sneers at success.

* * * *

The sign on the door of opportunity reads — *push*.

(To be continued)

Problems and Projects

Woodworking Joints and Their Uses

(Refer to illustrations on pages 63 and 65.)

Butt joints are used on the simplest kind of construction.

The half-lap joint may be used for connecting pieces end to end, as shown.

End-lap, middle-lap, and cross-lap joints are frequently used in lieu of mortise-and-tenon joints.

Miter joints are used on picture frames and for trimming and finishing with moldings.

Rabbet; dado; dado and rabbet; and dado, tongue and rabbet joints are used when better than butt joints are desired.

Tongue and groove joints are used on flooring, fencing, and ceiling materials.

Mortise-and-tenon joints of all kinds are used where greatest strength and best wearing qualities are desired.

Dovetail joints are used where the joints are subjected to pulling strains, or where great strength is desired.

Notched, end notched, and birdsmouth joints are used in house-framing construction.

Dowel joints are used in place of mortise-and-tenon joints. They are not as strong as the latter.

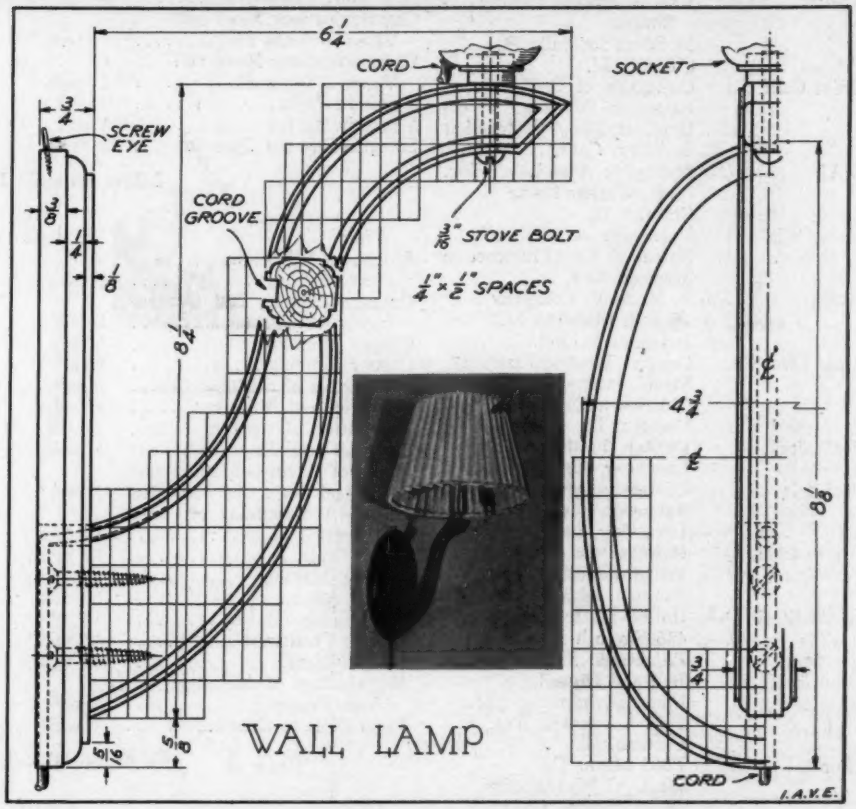
WALL LAMP

J. F. Mills, Roosevelt Junior High School, Middletown, Ohio

The wall lamp presented herewith has proved very popular with junior-high-school boys. It may be made of walnut, cherry, gum, or other suitable material that has an attractive grain.

It is useful and decorative, and yet may be made quite inexpensively.

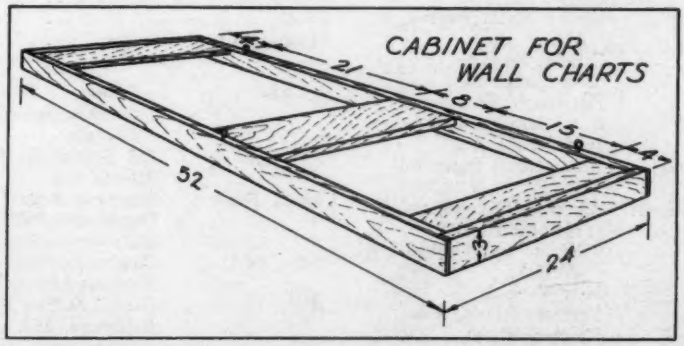
The project involves many valuable teaching units, such as planning and laying out, use of templates, jig saw, shaper, locating screw holes, sanding, finishing, and wiring.



SUSPENDED WALL-CHART CABINET

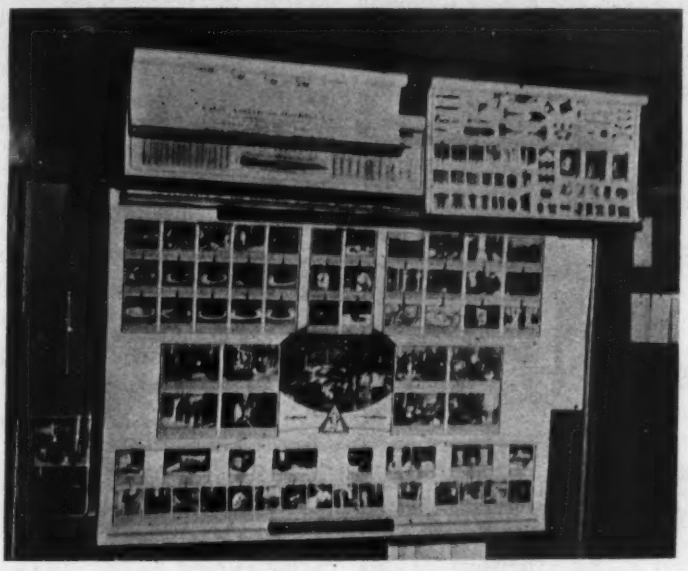
Chris. H. Groneman, Industrial Education Department, East Texas State Teachers College, Commerce, Texas

Many leading industrial-products companies make available to the teacher of industrial arts a great number of free or inexpensive instructional or informational charts. For sources of such materials see "Teaching Materials for Industrial Education," pp. 272–278, September, 1939, of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. These are considered good teaching aids because they tend to vitalize and enrich any verbal description of processes and products. The charts comprise one form of visual education which has been overlooked by many teachers of industrial arts, due to the fact that the teachers do not keep them in a readily accessible place in the room or shop. The accompanying device is intended to accommodate such charts and diagrams that are too large to be placed on a portable display rack as described on page 162 of the April, 1939, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.



When the charts are not in use they may be rolled up like any window shade. As may

be seen in the photograph, they are fastened either with tacks or glue to any ordinary window-shade roller which is assembled in the cabinet with the usual shade brackets. This cabinet, as shown in the drawing, will take care of nine large charts or eighteen narrow ones, and is so built as to care for these widths. It is suggested that the front and back rollers be placed in 2 in., with other rollers spaced 2½ in. on centers.



Cabinet for wall charts

The back screw eyes on the cabinet allow for hanging to screw hooks on the wall. The front of the cabinet is suspended from the wall with a small chain or wire as shown in Figure 2. This cabinet is a real piece of equipment, and should be painted to harmonize with the color scheme of the shop or laboratory.

CLOVERLEAF TITBIT DISH

C. C. Schwenk,
Upper Leacock High School,
Bird-in-Hand, Pennsylvania

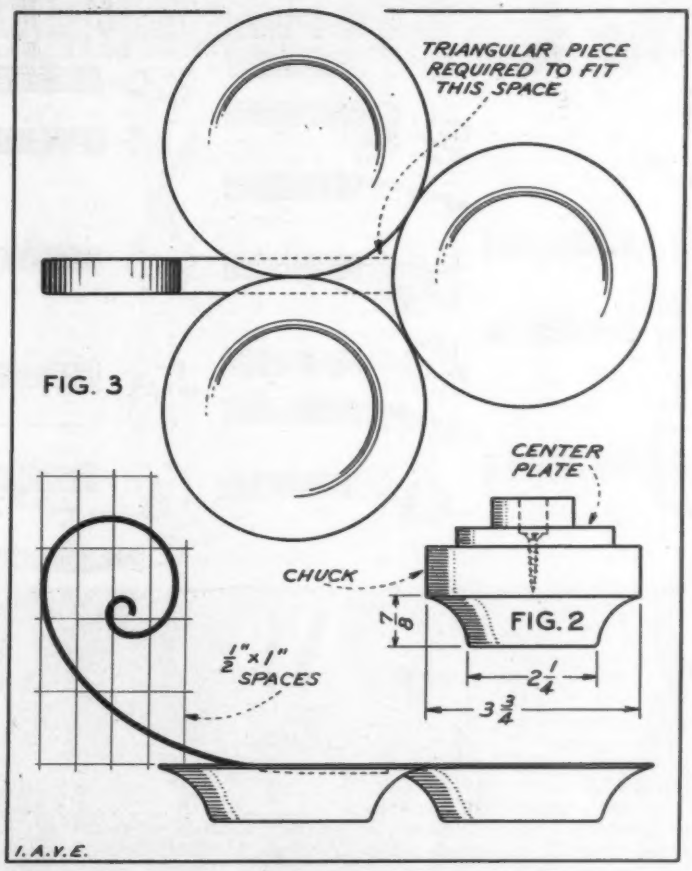
Figure 1 shows a beautiful titbit dish, which is suitable as a project in beginning art metal and spinning. It involves the use of the shears, laying out of circles and duplicate parts, filing, beating, bending, spinning, soldering, and polishing.

Copper is recommended for use in its construction, though other metals may be used. Pewter is not recommended, even though it is an easier metal to spin, because of the skill that would be required in soldering the three bowls together.

The first step necessary to make the dish, is to turn a chuck on the wood lathe, over which the three similar bowls may be spun. The dimensions of the chuck are given in Figure 2.

Maple or gum is a good wood to use to form the chuck. Do not use oak or other wood that has a coarse grain because the coarse grain will prevent the turning of a smooth chuck.

Fig. 1. Cloverleaf titbit dish



After the chuck is turned to the desired shape, sandpaper it to a good smooth finish. Any tool marks or irregularities on the chuck will be transferred to the metal spun over the chuck. For this reason it is very important that the chuck be satisfactorily formed.

Cut out 3 disks of 20-in. gauge copper, each 4½ in. in diameter. Anneal these pieces by heating to an iridescent red color, and quench immediately in water. This annealing is not absolutely necessary as the author has spun bowls of this and larger sizes out of soft copper without annealing the copper. However, annealing makes the metal pliable and easier to spin. After having annealed the disks, spin to shape on the lathe. Care must be taken in spinning so that the three bowls will be of the same size when finished.

The handle for the dish is made from a soft copper rod ¼ in. in diameter and 10 in. long. This rod is beaten and formed over a stake to the shape illustrated in Figure 1.

A certain amount of patience is required in assembling the pieces. First place the bowls bottom side up in exact position on a flat level surface, preferably on a marble or an asbestos slab. Cut a triangular piece of copper to fit into the triangular opening left between the three bowls. See Figure 3. Work this triangular piece to the exact shape with a file. When a snug fit is obtained, solder in place by means of a blowpipe. A soldering copper may be used but a better job will result if a blowpipe is used.

After the bowls have been properly soldered together, the handle should be soldered in place. This requires skill in the application of heat, so that the pieces to be united will be brought to the soldering temperature without melting the original joints that hold the three bowls and the triangular center piece together.

When the assembly is completed, remove all

excess solder with a scraper or knife. Be careful not to nick the copper. Finally polish the whole brightly with steel wool, and give the project a coat of clear lacquer to prevent tarnishing.

If you want to succeed in the world you must make your own opportunities as you go on. The man who waits for some seventh wave to toss him on dry land will find that the seventh wave is a long time acoming. — *John B. Gaugh.*

A GOOD TRANSPARENTIZER

Grant M. Paterson,
Science Department,
Central Junior High School,
Victoria, B. C., Canada

Industrial-arts teachers will find that the chemical, Diethyl Phthalate, has the unique power of dissolving the cellulose in ordinarily opaque paper, rendering it quite transparent without any deleterious effects to inked drawings.

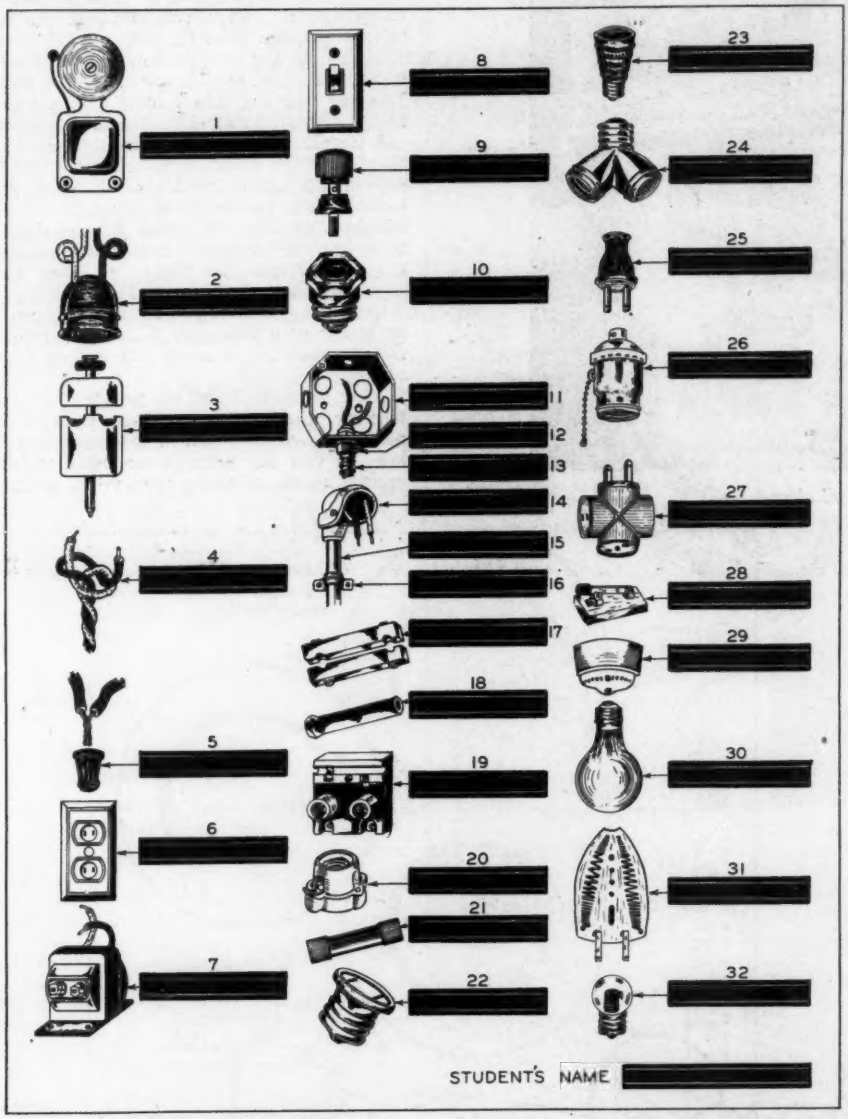
The sketches to be transparentized may be made on ordinary paper with blue-black permanent ink or with India ink. An unwatermarked lightweight bond will give the most satisfactory results. The finished drawings are then placed in the Diethyl Phthalate where the chemical action will render the paper quite translucent. Blueprints can then be made from the treated copy without resorting to the tedious process of painstaking tracing on expensive tracing paper or cloth.

The handling of this chemical does not require any special laboratory technique or procedures. The pieces of paper to be treated are laid face upward in a shallow basin, preferably glassware, and the solution poured directly over them. After a few seconds the paper becomes transparent and can be removed. It is ready for use after a careful blotting has removed any excess moisture. Ordinarily the whole process of treatment will not require more than thirty seconds. Any remaining solution should be carefully poured back into the container — its properties have in no way been impaired by contact with the paper.

Hand-drawn or typewritten lantern slides also may be produced by this inexpensive method. After the paper for these slides has been transparentized it is bound between two thin glass slide covers by narrow strips of cellulose tape. Dull-finish photographs will respond to the solution after a soaking of a minute or so. The photographs with the highly glossed finish do not, however, respond readily.

The chemical itself is not expensive, and any of the wholesale drug companies can supply it.

The pages of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE that have been expressly designed for reproduction by the blueprinting process may be treated with this chemical, and the printing done on the ordinary apparatus that is a part of every complete drafting room.



Electricity Test. Clifford L. Yard, Junior-Senior High School, Hastings-on-Hudson, New York

KEY TO ELECTRICITY TEST
Clifford L. Yard

1. Bell
2. Weatherproof Socket
3. Glazed Split Knob
4. Underwriter's Knot
5. Solderless Connector
6. Double Receptacle Plate
7. Bell Transformer
8. Switch Plate
9. Eby Binding Post
10. Plug Fuse
11. Outlet Box
12. Outlet-Box Connector
13. "BX" or Armored Cable
14. Entrance Cap
15. Conduit
16. Pipe Strap
17. Two-Wire Cleat
18. Porcelain Tube
19. Porcelain Cutout
20. Porcelain Receptacle
21. Cartridge Fuse
22. Plug Base
23. Heater Element
24. Double or Two-Way Socket
25. Plug
26. Pull-Chain Socket
27. Three-Way or Cube Plug-In Outlet
28. Knife Switch, S.P.S.T.
29. Porcelain Rosette
30. Incandescent Lamp
31. Flat-Iron Element
32. Neon Glow Lamp

TWELVE BY FOUR-FOOT UTILITY SKIFF

Claude W. Horst,
Milwaukee Vocational School,
Milwaukee, Wisconsin

The little skiff shown in Figure 1 is designed to serve an all-around purpose. It can be converted into a sailboat by adding a simple triangular sail and a set of leeboards. Or, for extended fishing and camping trips, it can be propelled by an outboard motor. The sides and the bottom are made of waterproof plywood, resulting in a job that is sturdy, but very light and easy rowing. Because it is very light it can also be transported easily from place to place on a trailer or carried in a cradle on top of the car.

There are several different ways of building a skiff; some prefer one method and some another, but for those who have never tried a job of this sort, the method described herein will be found very simple and satisfactory. It requires the construction of a substantial assembling frame that is structurally somewhat different from those most commonly used. It is so made that it holds the structural parts of the skiff absolutely in position while they are being assembled, thus assuring an accurate job. It not only supports the skiff at any stage of construction, but may be moved about or even set on end, without in any way disturbing the construction. This may prove to be an important factor where space is at a premium. The skiff is built right side up which is easier for the amateur.

Assembling Horse

The following material is required for the assembling frame or horse.

Assembling Horse Material List

No. Required	Name	Material	Size
2	Side pieces	Pine	1" x 12" x 11' 6"
1	Stiffener	Pine	2" x 8" x 9'
6	Uprights	Pine	2" x 8" x 27"
2	Ends	Pine	2" x 8" x 10"

Hardware for Skiff and Horse

½ doz.	Screws	⅝" No. 7 f.h. brass
1½ gross	Screws	¾" No. 5 f.h. brass
5 doz.	Screws	1¼" No. 7 f.h. brass
5 doz.	Screws	1½" No. 6 f.h. brass
7 doz.	Screws	1½" No. 7 f.h. brass
4 doz.	Screws	2" No. 7 f.h. brass
3 only	Screws	2¼" No. 7 f.h. brass
3 only	Screws	3" No. 10 f.h. brass
7 only	Bolts, carriage	5/16" x 4½", brass
2 only	Bolts, carriage	¼" x 2½", brass
	Bow strip, half round	½" x 24", brass

Construct the horse as shown in Figures 2 and 3. The 2 by 8-in. stiffener makes the structure of the horse very sturdy. This size stiffener is recommended if a number of skiffs are to be built on the same horse. If only one skiff is to be built, it is possible to substitute somewhat lighter stock. On the top edge of the two 1 by 12-in. side pieces, lay out very carefully the bottom curve of the skiff. To do this, first locate the positions of the cross sections as shown in Figures 3 and 4, and then cut notches for the cross sections and the transom. At the front end of the two side pieces cut away the stock to the bottom curve line so the siding pieces can be dropped into position. Cut off both ends according to the angle of the stem and transom as shown. Check these two pieces before assembling the horse and make sure that they are identical. Assemble the horse according to the detail drawing, Figure 3. The horse is now ready for use.

The following material is required for building the skiff proper (see skiff material list).

Method of Construction

Stem. The stem is made of two pieces, an inner stem, and an outer stem, as shown in the detail drawing, Figure 5. The piece for the inner stem should be about 10 inches longer than necessary for the stem proper. Shape the inner stem according to the detail drawing, and cut in the notches for the sheer and chine battens as shown. Attach the lower unfinished part of the stem to the front end of the horse, using two ¼-in. bolts of the proper length, or two No. 10 by 3-in. screws.

Transom. Consult the material list, and secure the proper size piece of wood. Shape it according to the dimensions given in the detail in Figure 4. Carefully bevel all edges as shown. Cut the transom frame pieces to length, notch them for the chine and sheer battens, and bevel them to fit the transom bevels as shown in Figure 6. Attach them to the transom pieces with No. 7 by 1¼-in. screws. Attach the transom to the transom support of the horse, making sure that the center line of the transom lines up with the center of the horse.

Frames. All the rib pieces should be cut about 4 in. longer than the actual rib length as given on the cross-section drawing, and the bottom ends of each rib cut at the angle shown. Since the angle is the same for all the ribs, only one T-bevel setting is required. Label the sets 1, 2, 3, 4, and 5. Bevel the edges of each set according to the angle given

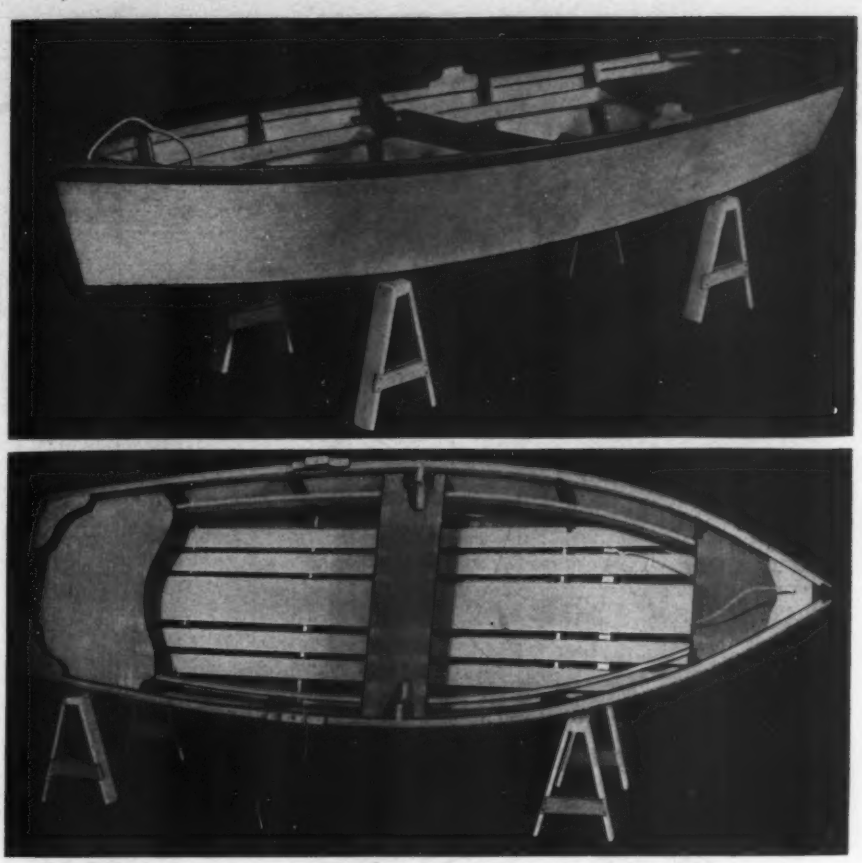


Fig. 1

Skiff Material List

No. Required	Name	Material	Size
1 pc.	Breast hook	Oak	1¼" x 6" x 12"
1 pc.	Transom knee	Oak	1¼" x 6" x 20"
1 pc.	Seat knee	Oak	1" x 4" x 12"
1 pc.	Oarlock blocks	Oak	1½" x 2½" x 20"
1 pc.	Keel strip	Oak	¾" x 2¾" x 12'
2 pc.	Siding	Pine or fir plywood	5/16" x 20" x 13'
1 pc.	Bottom	Pine or fir plywood	⅜" x 40" x 12'
36 l'neal ft.	Frames	Oak	¾" x 2"
2 pc.	Sheer batten	Pine	¾" x 1¼" x 13'
2 pc.	Chine batten	Pine	¾" x 1¼" x 12'
1 pc.	Stem (inner)	Oak	2¼" x 5¾" x 27"
1 pc.	Stem (outer)	Oak	1¾" x 3¼" x 20"
1 pc.	Transom	Pine	¾" x 16" x 3'
2 pc.	Seat clamps	Pine	½" x 2¾" x 13'
1 pc.	Seat (front)	Pine	¾" x 2' x 2'
1 pc.	Seat (center)	Pine	¾" x 12" x 4'
1 pc.	Seat (rear)	Pine	¾" x 22" x 3' 3"
2 pc.	Rub rail	Oak	¾" x 1¾" x 13'
1 pc.	Floor	Pine	¾" x 8" x 12'
4 pc.	Floor	Pine	¾" x 4" x 10'

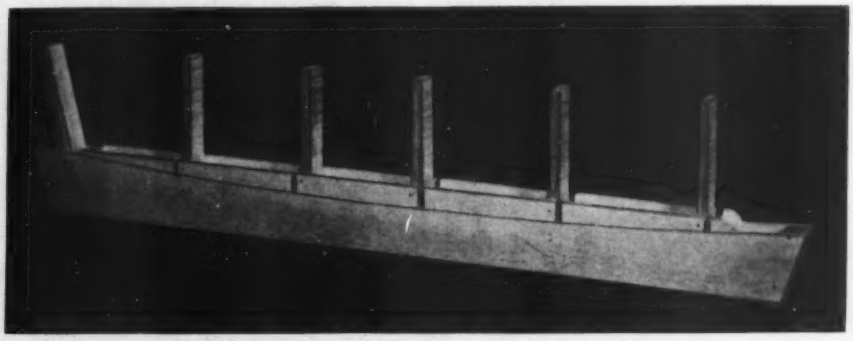


Fig. 2. Building horse

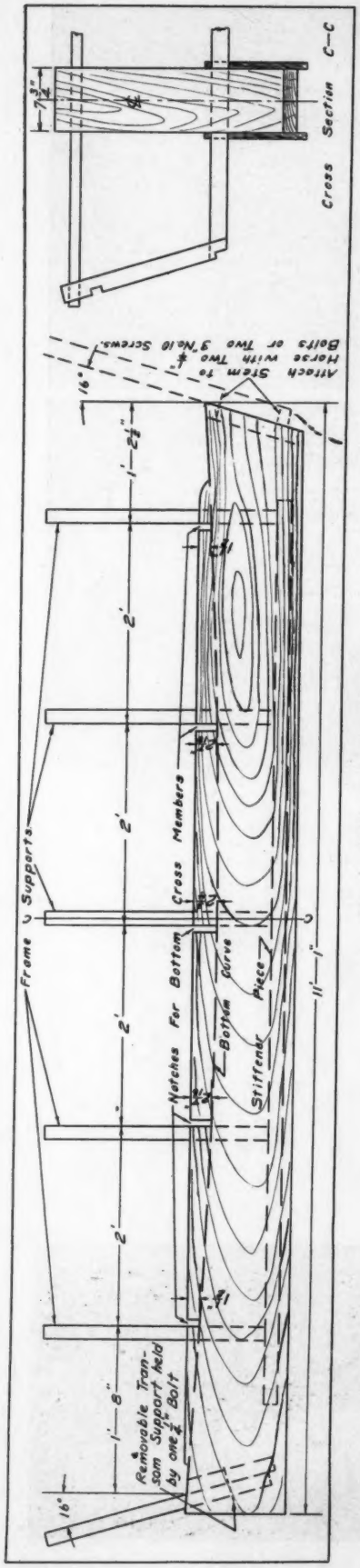

Cross Section C–C
Attach Stem to Horse with Two ½" Bolts or Two 3 No. 10 Screws.
Frame Supports
Cross Members
Notches For Bottom
Bottom Piece
Stiffener
Removable Transom Support held by one ½" Bolt

Fig. 3. Skiff construction horse

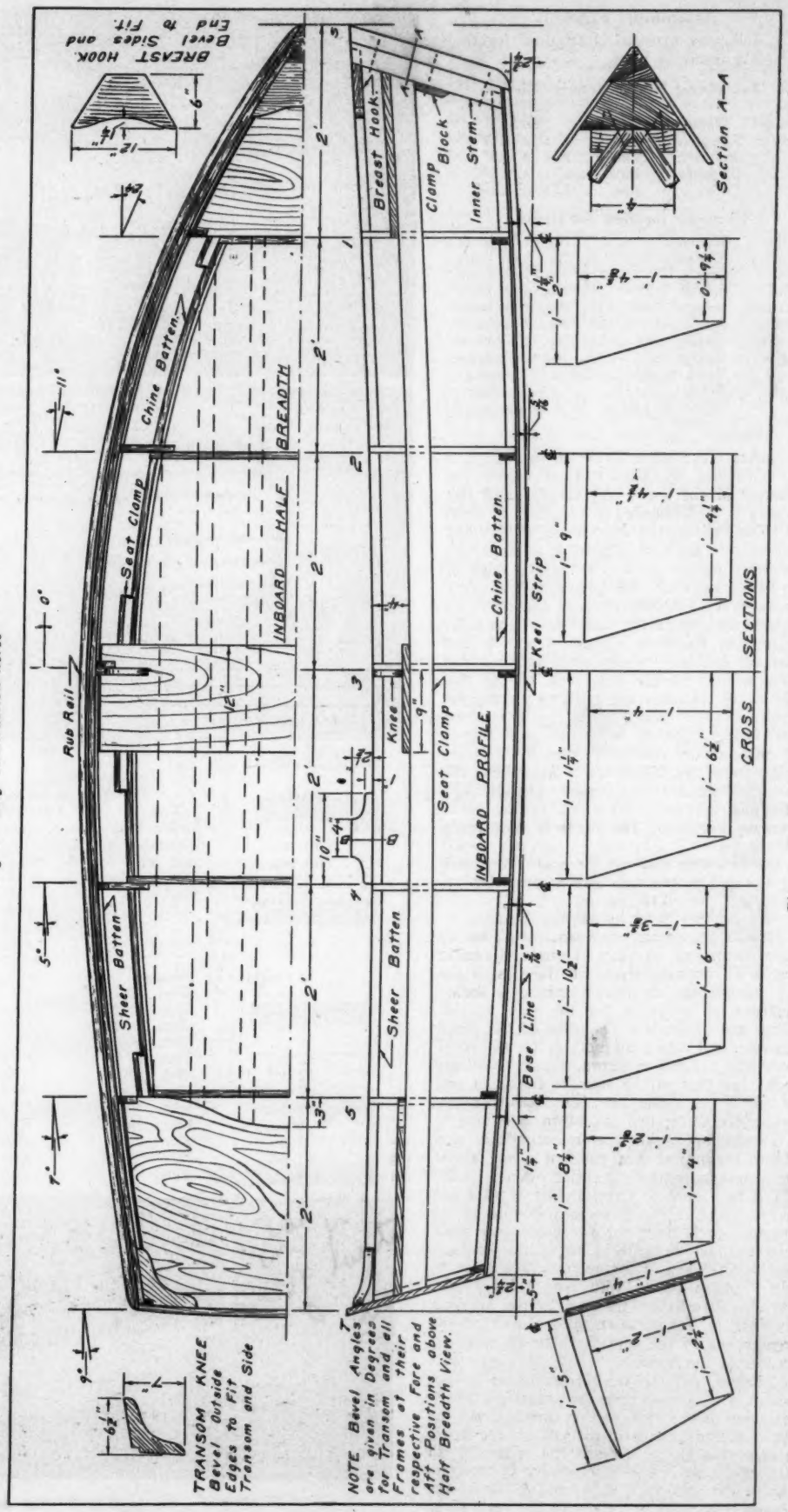


Fig. 4. Profile and half breadth plan

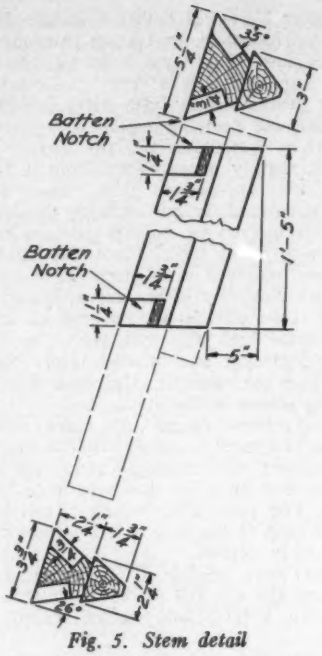


Fig. 5. Stem detail

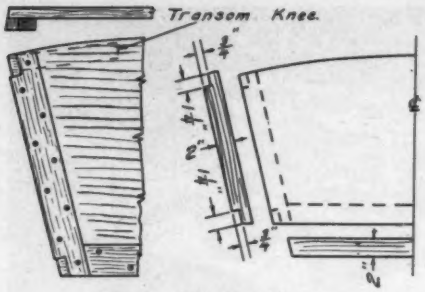


Fig. 6. Transom details

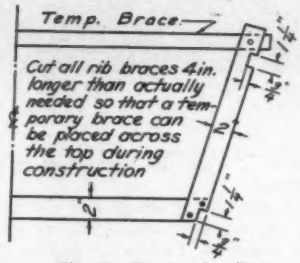

Temp. Brace
Cut all rib braces 4 in. longer than actually needed so that a temporary brace can be placed across the top during construction
12"
¾"
1¼"
¾"

Fig. 7. Frame detail

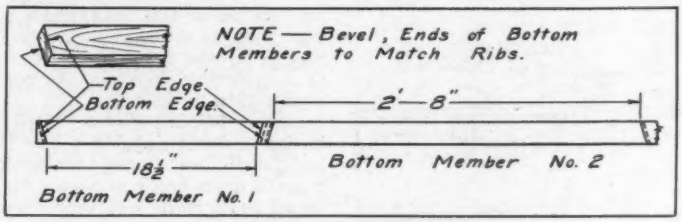


Fig. 8. Laying out bottom cross members

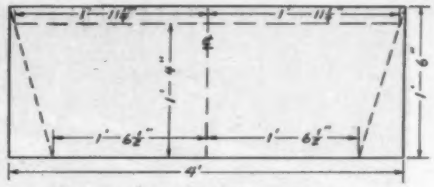


Fig. 9. Plywood laid out for No. 3 cross-section

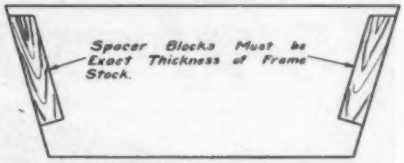


Fig. 10. Plywood template ready for use

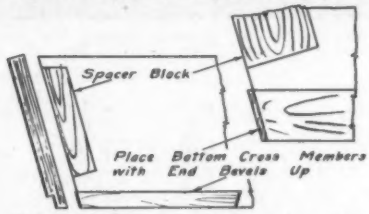


Fig. 11. Bottom cross member No. 1 in position on No. 3 template

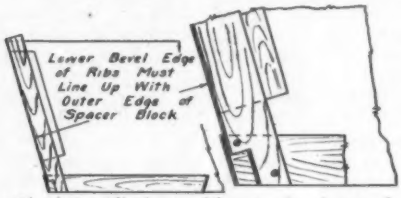


Fig. 12. Rib in position to be fastened to bottom member

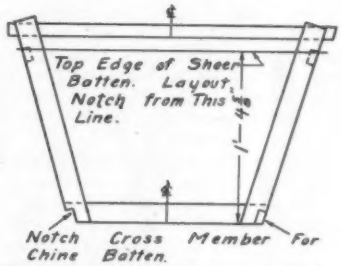


Fig. 14. Complete all batten notches

for each particular set on the half-breadth plan in Figure 4. The inside edge also should be beveled somewhat as the seat clamp will be attached to the inside of the ribs later. At this time notch all the bottom ends of the ribs for the chine battens as shown in Figure 7. The notch should have the same bevel as the outside edge of the rib so that the chine batten will fit properly at all the ribs. Mark and cut the bottom cross members as shown in Figure 8.

Assemble the frames on a template of cross section No. 3. To make the template, use a piece of quarter-inch plywood, 1 ft. 6 in. by 4 ft., and on it lay out very carefully cross section No. 3 using the dimensions given in Figure 4. The template is shown in Figure 9. The ends must be accurate and smooth. Attach to the template two spacer blocks which are the same thickness as the rib stock as shown in Figure 10. The template is now ready to use.

To assemble frame No. 1, place the bottom cross member as shown in Figure 11 with the end bevels up. Hold the piece in position with a C clamp or a couple of brads. Place the left rib in position with the bevel edge up and the lower edge in line with the space block as shown in Figure 12. Hold the rib in position with C clamps or brads and fasten rib and bottom cross members together with two, No. 7 by 1½-in. screws. Remove the clamps and move the frame to the opposite end of the template as shown in Figure 13. Repeat the process for the other rib and add the temporary brace shown across the top of the ribs and on the same side of the ribs as the bottom cross members. With the aid of a straightedge and a rule mark the sheer batten notch as shown in Figure 14. Cut out the notch for the sheer batten and complete cutting out the notch in the bottom cross member for the chine batten. All other frames are

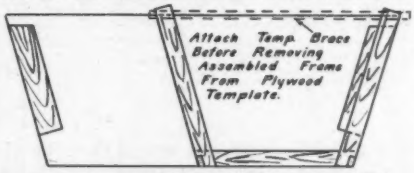


Fig. 13. Frame completely assembled and template brace attached

made in the same manner. The frame is then ready to be set in position on the horse. Figure 15 shows the stem, transom, and frame No. 3 on the horse.

In placing the frames in position on the horse, be careful that frames No. 1 and No. 2 are placed with the bevels forward, and frames No. 4 and No. 5, with the bevels aft. The center frame, having no bevel, may be placed either way. Center all the bottom cross members on the horse and tack in position. Center

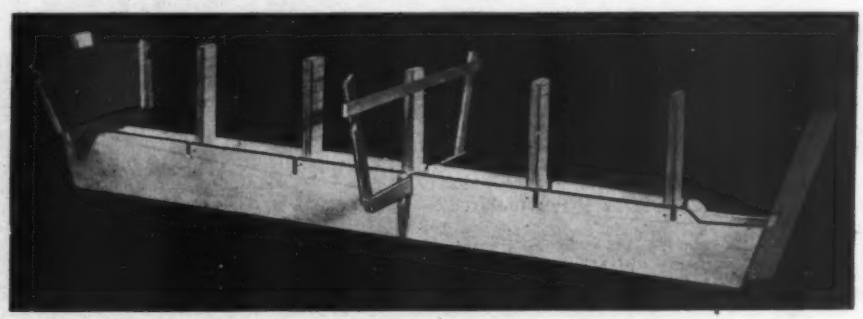


Fig. 15. Stem, transom, and No. 3 frame in position

Fig. 4. Profile and half breadth plan

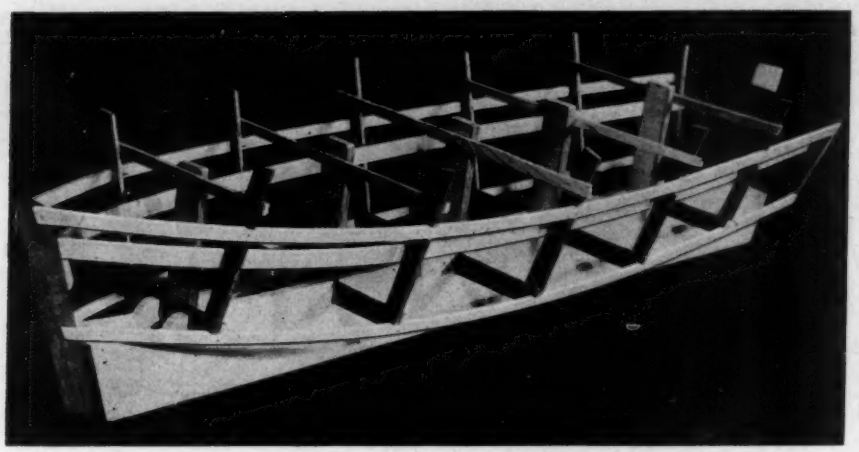


Fig. 16. Assembled frame

all the frame braces at the top and tack them in position.

Chine and Sheer Battens. To get the battens the proper length, first clamp them in place, then fit the aft ends, making sure that the ends of the battens are butted against the transom. Then cut the front ends to fit accurately in the stem notches. Attach the battens to the stem, the frames and the transom using No. 7 by 1½-in. screws at the places of contact. Figure 16 shows the structure with all the battens in place.

Seat Clamps. The seat clamp is a bit difficult to fit. First attach a block to the stem as shown in the profile drawing, Figure 4, upon which the seat battens may rest. This block may be attached with several No. 7 by 1½-in. screws, or it may be fastened with nails as shown at section *AA*, Figure 4. The proper length of the seat clamp may be found easily by using two flexible battens whose combined length is some four or five feet longer than the skiff. Tack these with their bottom edge along the line of the bottom edge of the seat clamp, Figure 4, then fasten them together where they overlap. The result is an exact measuring stick for the bottom edge of the seat clamp. Lay out the stem and transom bevels which extend outward at both ends, cut off the ends, and the clamp pieces are ready to install. Attach them to the ribs with No. 6 by 1½-in. screws, using two screws at each frame. Tack them to the stem with finishing nails. Figure 16 also shows the seat clamps in position.

Sides. Clamp in position the plywood side pieces and mark the bottom edge of the chine batten, the top edge of the sheer batten and the stem and the transom angles. Remove the pieces and shape them a bit oversize as marked. Smear marine glue on the contact surfaces of the stem and the transom, then lay ½-in. widths of cotton tape in the glue. Clamp the sides in position and attach them to the battens with No. 5 by ¾-in. screws spaced 6 in. apart.

Front and Back Seat. Shape and fit the front and the back seats of ¾-in. stock as shown in Figure 4. Attach the seats to the clamps with No. 6 by 1½-in. screws, using six to each seat. Figure 17 shows the front and back seats in place.

Remove the Skiff from the Horse. Remove all the frame braces except No. 3, which must not be disturbed until the center seat has been fastened in place. Remove all fastenings which hold the skiff framework to the horse and lift the skiff from the horse onto a pair of sawhorses.

The Center Seat. Shape and fit the center seat of ¾ in. by 12-in. stock as shown in Figures 4 and 18. Fasten the seat to the seat clamps with six, No. 6 by 1½-in. screws. Shape and fit the seat knees of 1-in. stock as shown in Figure 18 and attach them to the ribs with No. 7 by 1½-in. screws, and to the seat with ¼ in. by 2½-in. bolts. Trim off the top of all the ribs as shown in Figure 18. Dress the sides off even with the sheer battens.

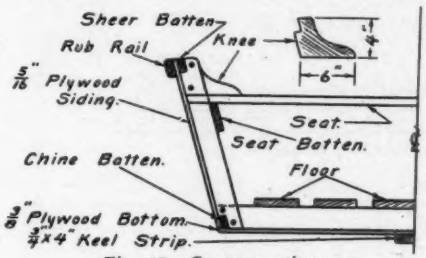


Fig. 18. Center section

Bottom. Turn the skiff upside down on the sawhorses and trim off the sides and the chine battens so they are flush with the bottom cross members. Cut off the projecting part of the stem even with the bottom of the chine battens.

Limber Holes. If limber holes are desired, they can be cut in the bottom cross members at this time. Make them ⅜ in. by 1 in. However, since the skiff is very light it is really easier to remove any bilge water by beaching the skiff and dumping it out.

Bottom Piece. Lay out the bottom piece. Cut it slightly oversize, and trim it to size after it is fastened in place. Smear marine glue all around the bottom edge and lay cotton tape in the glue, holding the tape in position with small tacks. Place the bottom in position and tack it in place. Then screw it on with No. 6 by ¾-in. screws, spaced 6 in. apart. Trim off the bottom edge all around. Attach the keel strip with No. 7 by 1¼-in. screws, placing two at each cross member including the transom. Use two, No. 7 by 2¼-in. screws at the stem.

Outer Stem. Shape the outer stem as shown in Figures 4 and 5. Trim off the siding pieces even with the inner stem, and attach the outer stem to the skiff with three 5/16-in. bolts. For protection, attach a metal half-round strip to the nose of the stem with No. 6 by ⅝-in. screws.

Rub Rail. Round off the lower outside edge of the rub rail pieces and attach them with No. 7 by 1½-in. screws, spaced 12 in. apart.

Floor. Make the floor of ¾-in. stock, using four pieces 4 in. wide, and a center piece 8 in. wide, as shown in Figure 19. The pieces may be screwed to the bottom cross members, or a removable floor like the one shown in Figure 19 may be used.

Oarlock Blocks and Oars. Shape the oarlock blocks as shown and drill a hole for the oarlocks all the way through the block providing a small drain notch as shown in Figure 20. Attach each block with four No. 7 by 2-in. screws. Secure a pair of straight-grained seven-foot ash oars, and a pair of oarlocks to match.

Fig. 19

Finish. Since the job is made mostly of plywood, very little sanding is necessary, but smooth it wherever needed and apply at least four coats, inside and out, of good marine paint, or marine varnish, allowing at least 24 hours between coats, even though it is a quick-drying variety.

Sailing. If the boat is to be used for sailing, bore a 3-in. hole through the front seat for the mast, and make a mast step as shown in Figure 21. Attach the mast step to the

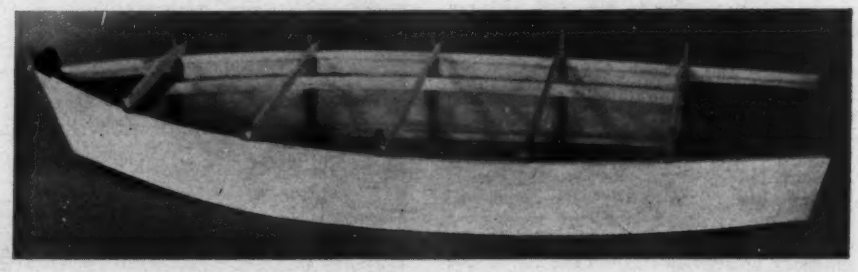


Fig. 17. Front and back seat in place

bottom with No. 7 by 2-in. screws, which are screwed up from the bottom of the boat into the mast-step block. For slant of mast see Figure 22.

To prevent the boat from skidding sideways when sailing, make a set of leeboards

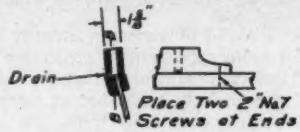


Fig. 20. Oarlock block

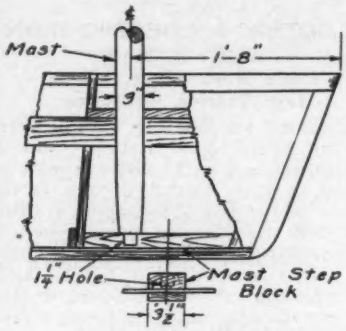


Fig. 21. Mast support

as shown in Figures 22 and 23. These can be attached in a few minutes with thumb screws. They may be moved forward or aft to get a good sailing balance. They should be made of a good grade of ¾ in. by 12-in. stock pine to which is attached a piece of ½-in. pine to give additional strength to the upper ends of the boards. The ½-in. piece is attached with casein glue.

The small triangular sail which is used, is attached in a very simple manner to a good straight-grained spruce mast with 3½-in. metal rings as shown in Figure 22, and with a few lacings to a boom which may be made, as shown, of a good grade of pine. The sail may be put up or taken down in a few moments. For steering, an oar does very well;

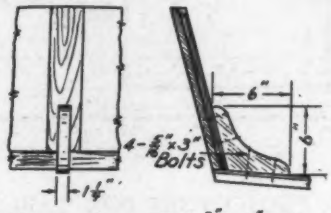


Fig. 24. Strengthening transom for outboard motor

however, a small rudder may be made if desired.

Using an Outboard Motor. If it is planned that an outboard motor is to be used, the transom should be reinforced at the center and the bottom as shown in Figure 24, with an additional center piece added and a knee fastened to the transom and to the keel with four 5/16-in. bolts.

SEPTIC TANK

Verrol R. Conklin,
Head, Industrial Arts Department,
High School,
Hastings, Michigan

A good project for the farm shop or for the plumbing department of the general shop is the septic tank.

The septic tank, here described, will take care of the small family providing the distribution field is adequate.

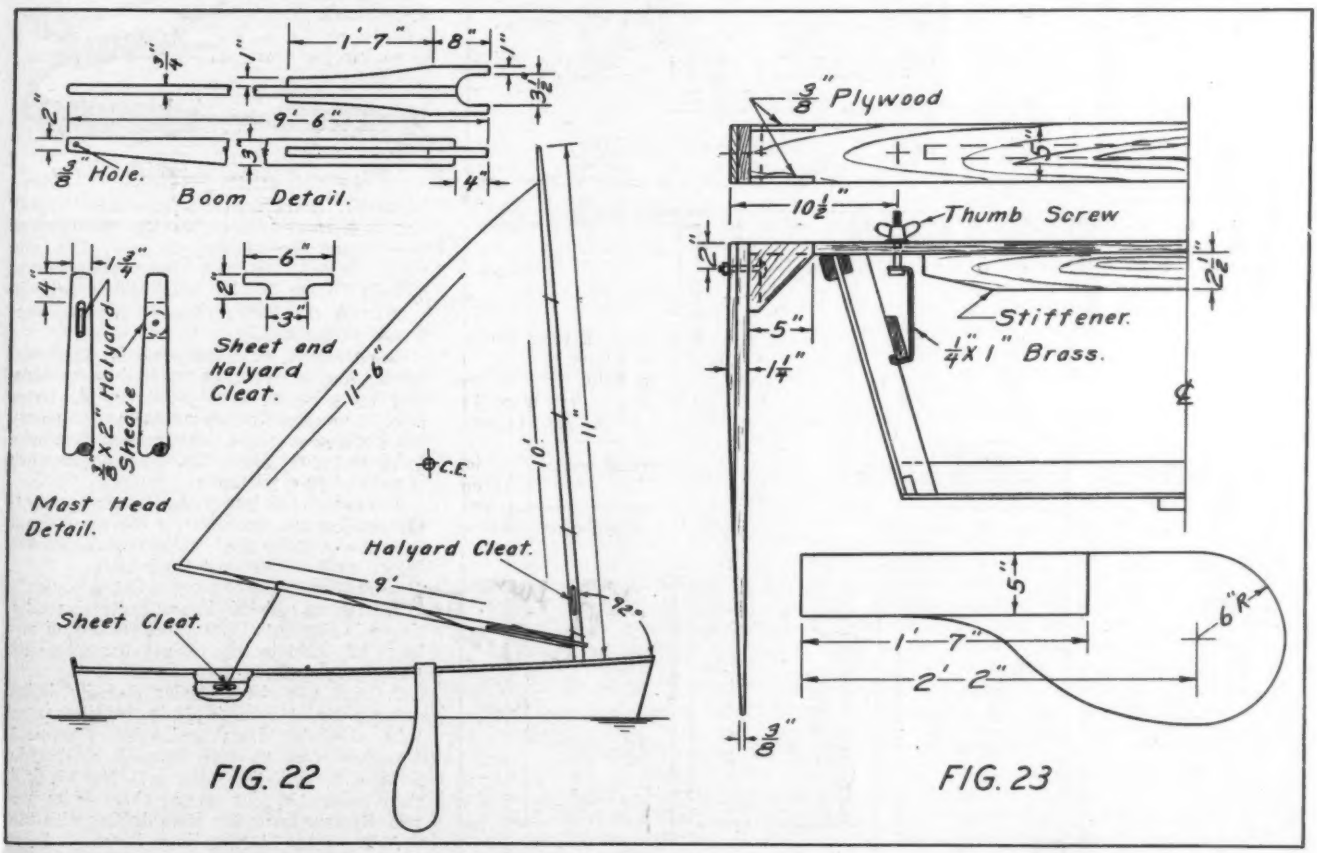
Job: Plumbing.

Aim: To familiarize the student with the septic tank.

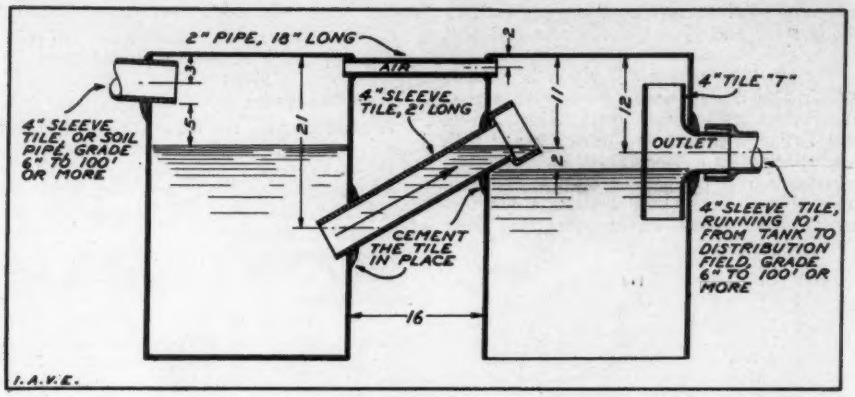
Notes: There are several different types of septic tanks. This tank is made up of two oil barrels. With the proper type of disposal field, this tank will be quite satisfactory for a small family. If the system is used for a bathroom, the stack that is along with the stool will furnish enough air, but if just a kitchen sink is used, an outside air vent should be placed in the inlet.

Procedure:

1. Obtain two 50-gallon oil barrels.
2. Cut the bottom ou of the second barrel, and if desired the top may be cut out of the first barrel and a cement cover put in its place, to make it more handy for cleaning out.
3. Paint the barrels with tar inside and out.
4. Cut holes for tile in the barrels as shown.
5. The top of the system should be placed one foot under the earth's surface.
6. Place the tile in the barrels as shown and cement them in place.
7. The 4-in. sleeve tile should lead away from the tank at least 10 feet to the disposal field.



Sail and rigging detail *Leeboard details*


2" PIPE, 18" LONG
AIR
4" SLEEVE TILE, 2' LONG
4" TILE "T"
4" SLEEVE TILE OR SOIL PIPE, GRADE 6" TO 100' OR MORE
OUTLET
CEMENT THE TILE IN PLACE
4" SLEEVE TILE, RUNNING 10' FROM TANK TO DISTRIBUTION FIELD, GRADE 6" TO 100' OR MORE
16
I.A.V.E.

Septic tank

8. The disposal field should be put in, either with drain tile laid about one foot underground, with open joints, or trenches may be dug and filled with rock or old concrete to allow drainage.

9. A 2-in. pipe is placed between the tanks to let air into the second.

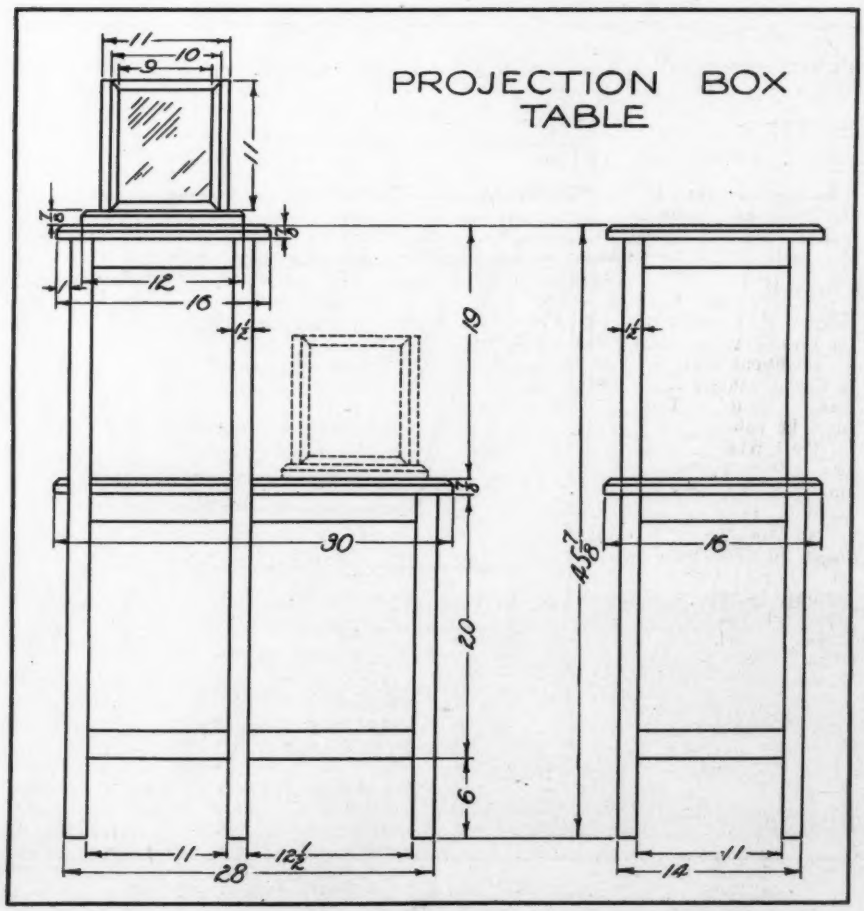
Questions:

1. What is the purpose of the 2-in. pipe running between the barrels?
2. Why should there be an air vent in the inlet?
3. What is the advantage of cutting the bottom out of the second barrel?
4. What is the advantage of cutting the top out of the first barrel?

A PROJECTION BOX TABLE

Maurice E. Trout,
Industrial Arts Director,
Aspinwall Public Schools,
Aspinwall, Pennsylvania

There are few teachers of mechanical drawing today who have not at some time in their teaching experience used a projection box of one kind or another. Our projection box did not function properly until we devised a table of two levels. This brings the top view easily within the reach of the smallest boy in our junior high school, whereas before the boy had to climb on top a stool and balance himself in a precarious position until he completed sketching the desired view.



The projection box is made up of four frames of .062-in. celluloid, hinged to swing in the position of the vertical plane, after the top, front, and end views have been completed. For sketching in the views, white tempera paint and a small water-color brush are used. This can be readily washed off the celluloid with a moist rag.

We have found by having a number of the first projects in orthographic projection made of wood and then demanding that the beginner first use the projection box before attempting to make the drawing, that third-angle projection is not so difficult for even those of low I.Q. and this projection-box table really does function.

ELECTRIC SOLDERING IRON

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Eagle Rock High School,
Los Angeles, California

The electric soldering iron described herein embodies several novel features which are not usually found in the soldering irons constructed in school shops. Foremost of these features is the special composition element upon which the resistance wire is wound. The usual method of providing the heating element is to wrap a layer or two of asbestos around the copper core, and then wind the resistance wire over the asbestos. Owing to the necessity of spacing the wire, it is usually necessary to wind the wire in two layers, all of which results in a very bulky iron. A further disadvantage of winding the wire over sheet asbestos is that the asbestos gradually disintegrates under heat. This makes frequent renewals of the heating element necessary.

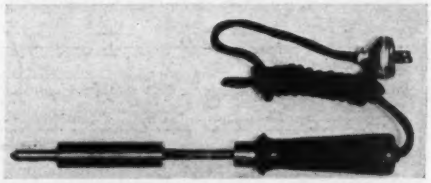


Fig. 1. The assembled soldering iron

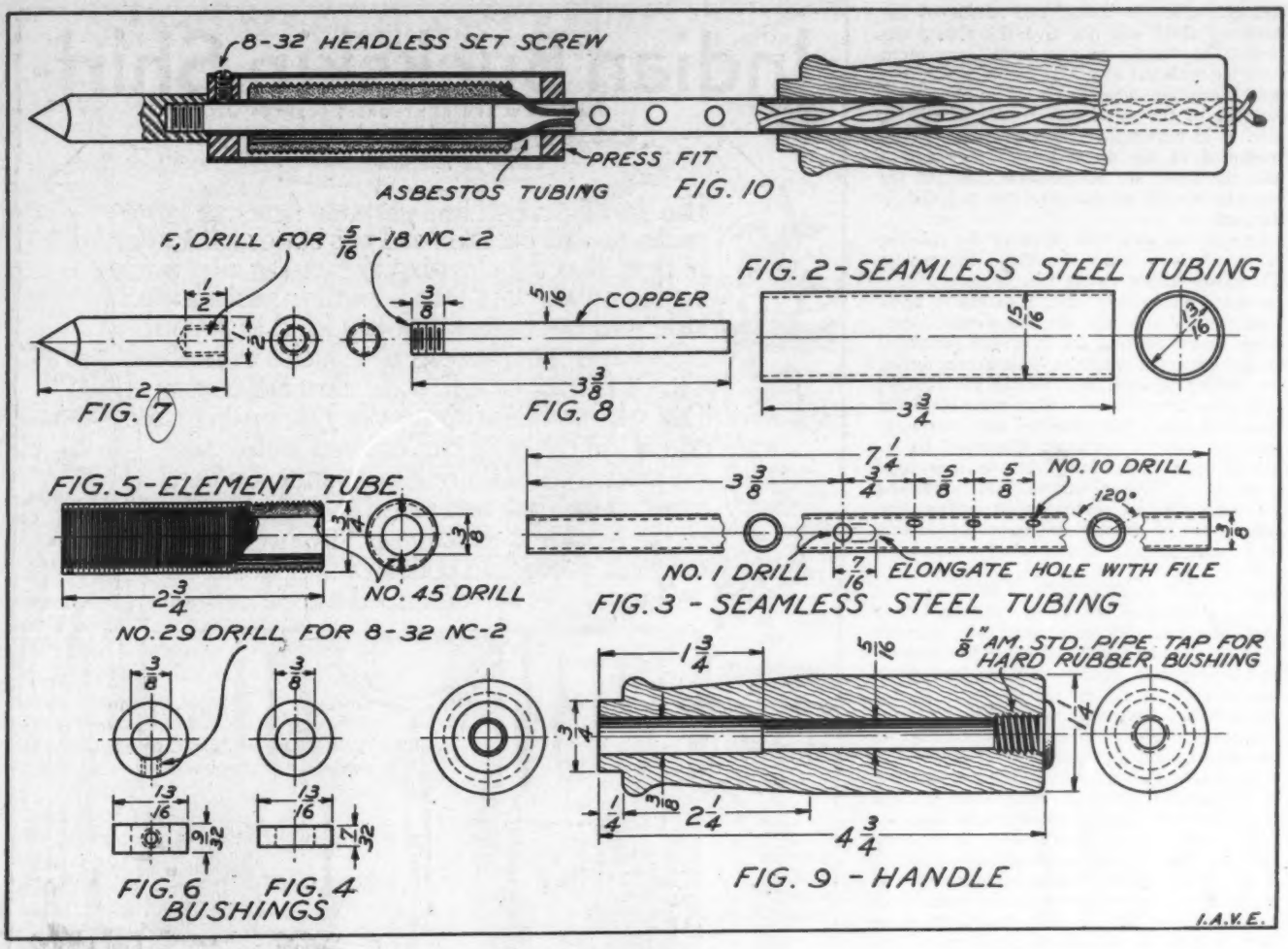
Another novel *feature* of the iron is that the tip is removable, so that tips of different sizes to suit the job may be used. The tube which carries the leads from the heating element to the handle is drilled to provide ventilation and prevent heat from being conducted to the handle.

The complete set of parts may be purchased in kit form, or where the material is available, may be made up from stock. In the latter case, it would be necessary to purchase only the special element tube. Since all of the material is of regular stock size, the machine work is reduced to a minimum.

The completed iron makes a very presentable project and one which is not too difficult for junior-high-school boys to construct. Figure 1 shows the completed iron.

Construction

1. True up ends of element protection tube, shown in Figure 2. With a file, smooth off any burrs left inside of the tube. Polish tube with fine emery cloth.
2. Drill two diametrically opposite holes, using a No. 1 drill, in 3/8-in. seamless steel tube, 3 3/8 in. from end. See Figure 3. Lengthen holes to 7/16 in. with round file. Drill nine ventilation holes with No. 10 drill, three rows 120 deg. apart, three holes per row. Remove burrs left from drilling with file.
3. Press on 7/32-in. brass bushing, shown in Figure 4, to position nearest handle.
4. Drill element tube at angle with No. 45



Electric soldering iron

drill, as shown in Figure 5. Drill hole in opposite end of tube with No. 45 drill, at right angle to meet small hole running length of tube. (The tube comes with one small hole running length of tube already drilled.)

5. Double back 9 in. of No. 30 nichrome resistance wire, twist together, and clip off loop. Pass this doubled length through hole drilled at angle in element tube twice to secure end of wire. Wind wire in threaded portion of tube until opposite end is reached. Pass end of wire through small hole twice, twist remaining wire into a double lead about 9 in. long and pass through small hole running length of tube. Insulate twisted leads with 6 in. of asbestos tubing.

6. Slip wound element over ⅜-in. steel tube. Pull insulated leads through elongated hole and through the length of the tube with piano wire or a piece of some other stiff wire. See Figure 10.

7. Place the element protecting tube over the element and 7/32-in. bushing so that it comes even with edge of bushing. Press on the 9/32-in. bushing, shown in Figure 6, flush with end of ⅜-in. tube. Drill hole through element protection tube, bushing wall, and one side of inner steel tube, 9/64 in. from tip end of iron with No. 29 drill. Tap hole with No. 8/32 tap for setscrew.

8. Drill and tap copper tip as shown in Figure 7. Thread 5/16-in. copper rod with 5/16-in. NC die. See Figure 8. File point on copper tip. If a very small tip is desired for fine work, a point may be filled on the unthreaded end of the 5/16-in. copper rod. It will be necessary to only loosen the setscrew and reverse the rod whenever a small point is desired.

9. The shape of the handle shown in Figure 9 is merely suggested. Handles may be turned out on a wood lathe, or purchased, as conditions warrant. Large file handles make excellent handles for soldering irons and are very inexpensive. The appearance of the iron may be enhanced by adding a brass ferrule to the handle, as shown in Figure 1. Tap the end of the handle with ⅛-in. pipe tap and insert a hard rubber socket bushing. Attach cord to element leads and tape the joint. Wrap tape around portion of cord that will come just to inside edge of rubber bushing to relieve strain on connections. Pass cord through handle and rubber bushing and force steel tube into handle. Attach plug cap to ends of cord, test for grounds and shorts. The iron is now ready to use.

Materials Required

- 1 pc. seamless steel tubing, 22 gauge, 15/16 in. O.D., 3¾ in. long
- 1 pc. seamless steel tubing, 22 gauge, ⅜ in. O.D., 7¼ in. long
- 1 brass bushing, 13/16 in. O.D., ⅜ in. I.D., 9/32 in. thick
- 1 brass bushing, 13/16 in. O.D., ⅜ in. I.D., 7/32 in. thick
- 1 composition element tube
- 18 ft. nichrome resistance wire, No. 30 gauge
- 1 pc. copper rod, 5/16 in. diameter, 3⅜ in. long
- 1 pc. copper rod, ½ in. diameter, 2 in. long
- 2 pc. asbestos tubing, ⅛ in. inside diameter, 6 in. long
- 6 ft. No. 18 heater cord
- 1 rubber socket bushing
- 1 handle
- 1 No. 8/32 setscrew

THE CLEANING AND COLORING OF METALS

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Bronxville Schools,
Bronxville, New York

Projects made of metal may be greatly enriched by proper coloring and finishing. The natural color of some metals such as, pewter, gold, and silver is all that is required of these metals, but the nonferrous alloys, rich in copper, may be enhanced by different treatments. Copper alloys that are low in copper are more difficult to color than alloys high in copper. Since copper is one of the metals used extensively in school craftwork it will be given the major attention in this article.

The coloring of metals is a phase of metal craftwork that is an art in itself. There are many problems that must be mastered along with the mixing of solutions or baths from

formulas given in books. The mixing of the solutions alone will not give the results desired. The "tricks of the trade" are often admitted with the expectation that the craftsman knows just what to do. The proper temperature of the solution, accuracy in mixing, time of immersion, composition of the metal, treatment of the metal after immersion to hold the color, are all problems that call for experimentation unless they are included in the formula.

One of the important steps in the coloring of metals is to clean the metal thoroughly. Chemically clean metals will often eliminate problems before they have a chance to arise. New metals, although they may look clean, often have a surface oil or grease embedded in the fine grain structure. This occurs during the rolling process. Old metals are covered with a surface oxide as well as some oil, while metals that are being worked and constantly annealed, have a fire scale that must be removed after every firing. Metals that have been buffed have a surface film of buffing compound. All of these foreign surface materials must be removed before proper coloring or finishing may be accomplished

The Cleaning of Metals

The cleaning of metals in the school shop should be done with the greatest care. Solvents such as gasoline and benzine are fire hazards and forbidden by many state fire laws. Shop metals may be safely cleaned with several commercial detergents obtainable in most grocery stores. Oakite is an alkaline cleaner that is safe and dependable. It is used hot in solution and the metal is agitated while it is in the solution. After cleaning, rinse in clean hot water and then in clean cold water.

Do not touch the metal while it is being cleaned. Use spring clothespins or attach a wire to the metal. Follow this cleaning with an acid dip to further clean the metal. For bright dipping, the metal should be quite dry. A good bright dip is made up of the following acids:

Bright Dip

Sulphuric acid	1 part
Nitric acid	¾ part

Use this solution cold. Dip the metal article in the solution for a moment and then dip quickly into clean cold water. This is a very strong solution and will make the metal fume. If the metal is allowed to remain too long in this solution, a matte or satin finish will be obtained. This is also true if the solution is too warm. This matte surface is excellent on articles that are being worked or just about to be planished. The stroke of the hammer will leave a bright spot making it very easy to see just where the planishing marks are being placed. If the metal has been dipped too long and a matte surface has been produced and not wanted, it may be brightened by dipping it in the following solution:

Hydrochloric acid	6 parts
Nitric acid	1 part
Water	2 parts

After the metal is taken from either of the two solutions given it will soon tarnish. This may be prevented by dipping the metal in a weak solution of argol or tartaric acid and water. This must be done, however, after it has been cleaned in water after the dips.

The different solutions may be kept in old storage-battery boxes that have the partitions knocked out. Commercial stone crocks are also available but are rather expensive. If ordinary jars are used the inside should be painted with asphaltum or pitch. A special bench is required for all of these solutions and it should be placed near a window where a hood may be erected over the bench. The fumes of acid may be removed by a kitchen exhaust fan placed in the window. This is an important part of the shop equipment if metals are to be cleaned with acids. The fumes are often injurious if inhaled.

When metals are annealed or tempered by heat, a fire scale forms on the surface of the metal. This oxide must be removed before further work is carried on or the scale will be hammered into the metal. One of the primary rules of the metal shop is to work with clean metal. There are several solutions that will remove fire scale successfully. The following have been tried and recommended:

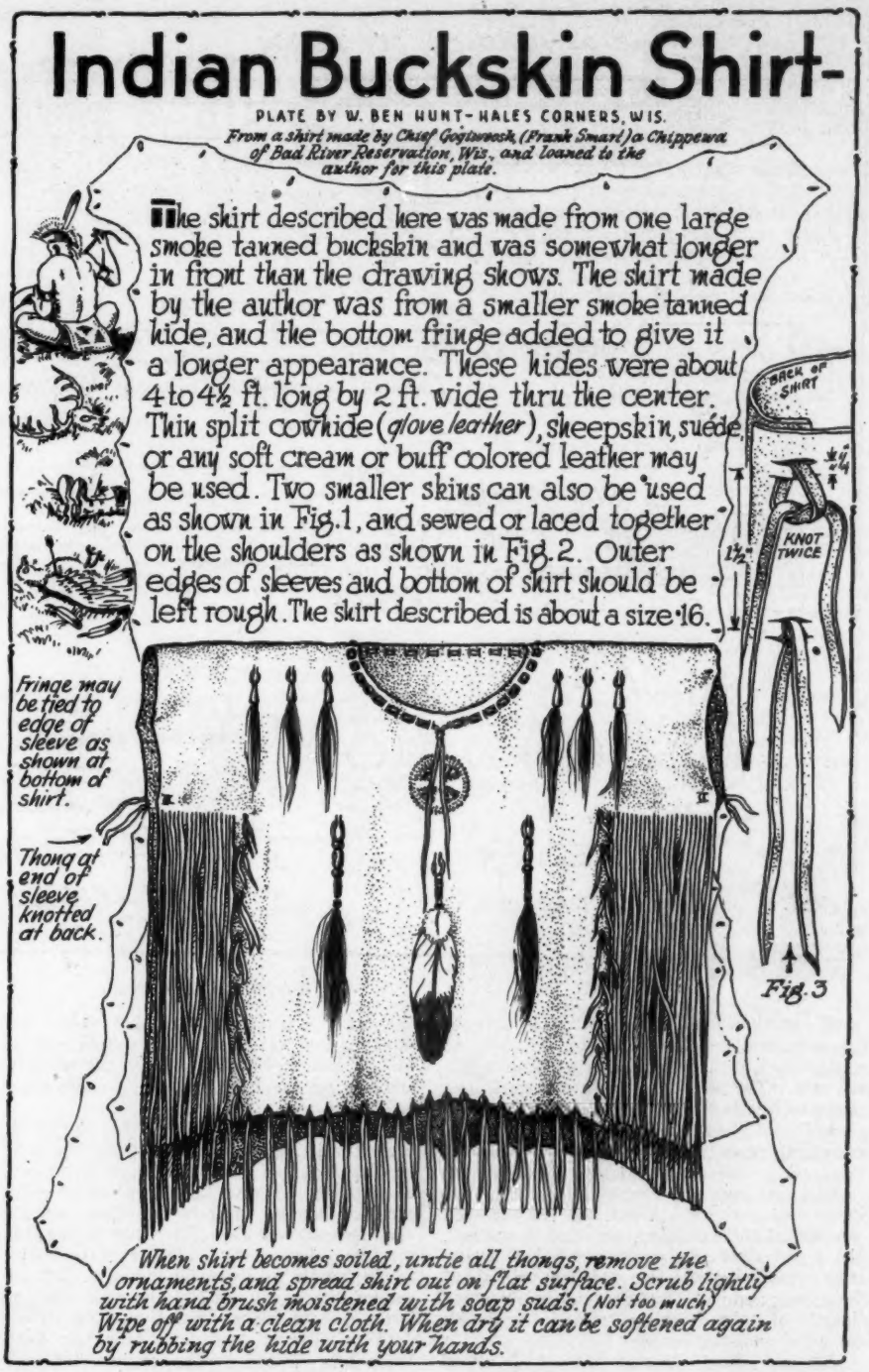
Cleaning Fire Scale from Copper or Copper Alloys

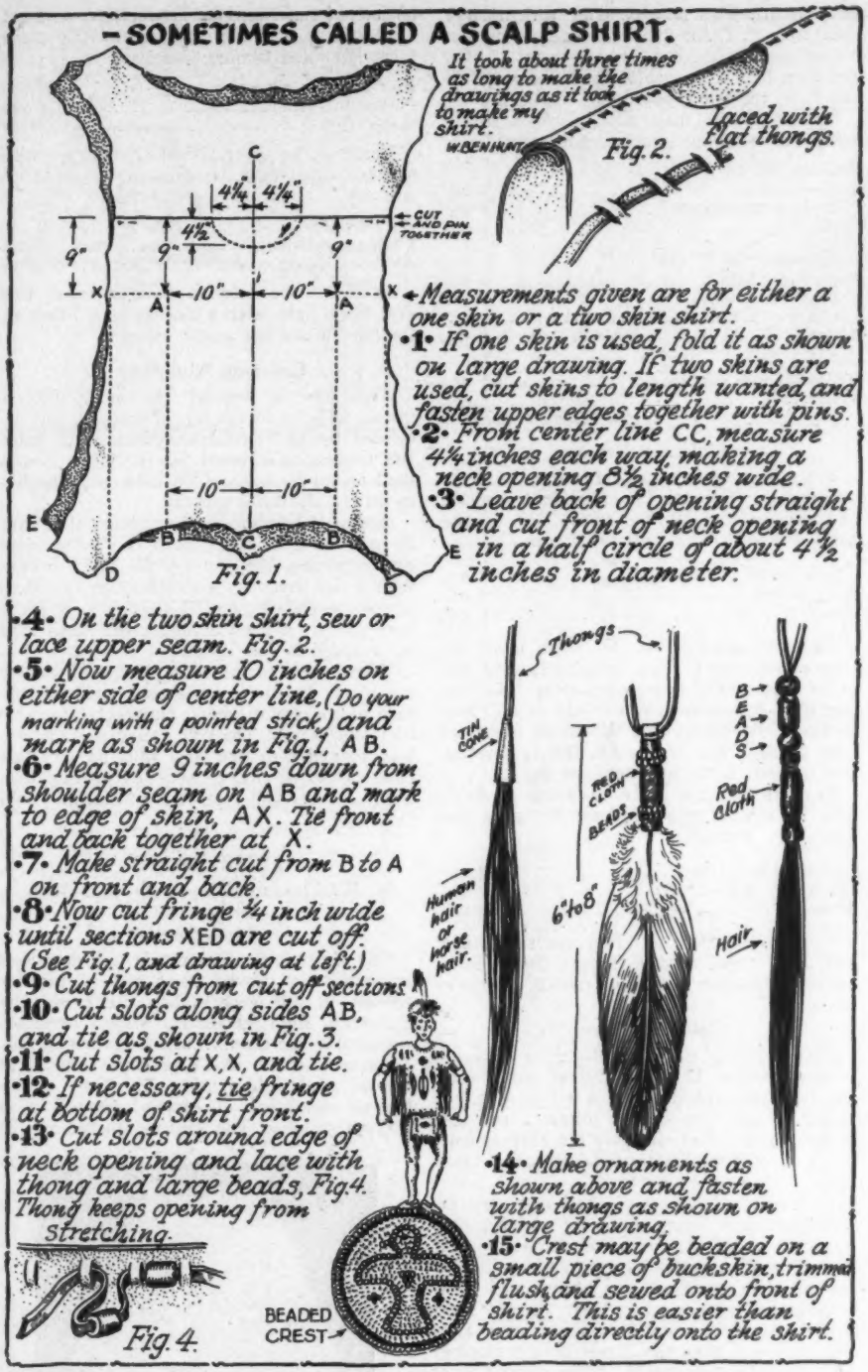
The Burn-Off Dip

Nitric acid	1 part
Sulphuric acid	2 parts
Water	5 parts

To mix this solution add the nitric acid to the water, stir well, and then add the sulphuric. Sulphuric acid should always be added to nitric acid. Use cold.

Insert the metal in the dip and leave for five or ten seconds. Remove and rinse in cold water. The article will be clean of fire scale


Indian Buckskin Shirt-
PLATE BY W. BEN HUNT - HALES CORNERS, WIS.
From a shirt made by Chief Gogiwesh (Frank Smart) a Chippewa of Bad River Reservation, Wis., and loaned to the author for this plate.
The shirt described here was made from one large smoke tanned buckskin and was somewhat longer in front than the drawing shows. The shirt made by the author was from a smaller smoke tanned hide, and the bottom fringe added to give it a longer appearance. These hides were about 4 to 4½ ft. long by 2 ft. wide thru the center. Thin split cowhide (glove leather), sheepskin, suede or any soft cream or buff colored leather may be used. Two smaller skins can also be used as shown in Fig. 1, and sewed or laced together on the shoulders as shown in Fig. 2. Outer edges of sleeves and bottom of shirt should be left rough. The shirt described is about a size 16.
BACK OF SHIRT
KNOT TWICE
1½"
Fringe may be tied to edge of sleeve as shown at bottom of shirt.
Thong at end of sleeve knotted at back.
Fig. 3
When shirt becomes soiled, untie all thongs, remove the ornaments, and spread shirt out on flat surface. Scrub lightly with hand brush moistened with soap suds. (Not too much) Wipe off with a clean cloth. When dry it can be softened again by rubbing the hide with your hands.


SOMETIMES CALLED A SCALP SHIRT.
It took about three times as long to make the drawings as it took to make my shirt.
W BENHAM
Laced with flat thongs.
Fig. 2.
CUT AND PIN TOGETHER
Measurements given are for either a one skin or a two skin shirt.
•1• If one skin is used, fold it as shown on large drawing. If two skins are used, cut skins to length wanted, and fasten upper edges together with pins.
•2• From center line CC, measure 4¼ inches each way, making a neck opening 8½ inches wide.
•3• Leave back of opening straight and cut front of neck opening in a half circle of about 4½ inches in diameter.
Fig. 1.
•4• On the two skin shirt, sew or lace upper seam. Fig. 2.
•5• Now measure 10 inches on either side of center line, (Do your marking with a pointed stick,) and mark as shown in Fig. 1, AB.
•6• Measure 9 inches down from shoulder seam on AB and mark to edge of skin, AX. Tie front and back together at X.
•7• Make straight cut from B to A on front and back.
•8• Now cut fringe ¾ inch wide until sections XED are cut off. (See Fig. 1, and drawing at left.)
•9• Cut thongs from cut off sections.
•10• Cut slots along sides AB, and tie as shown in Fig. 3.
•11• Cut slots at X, X, and tie.
•12• If necessary, tie fringe at bottom of shirt front.
•13• Cut slots around edge of neck opening and lace with thong and large beads, Fig. 4. Thong keeps opening from stretching.
Fig. 4.
Thongs
Tin cone
Red cloth
Beads
6" to 8"
Human hair or horse hair.
B E A D S
Red cloth
Hair
•14• Make ornaments as shown above and fasten with thongs as shown on large drawing.
•15• Crest may be beaded on a small piece of buckskin, trimmed flush, and sewed onto front of shirt. This is easier than beading directly onto the shirt.
BEADED CREST

and may now be given a bright dip or a matte dip.

Bright Dip

Nitric acid	1 part
Sulphuric acid	2 parts
Water	¼ part

To mix this solution add the nitric acid to the water, stir well, and then add the sulphuric acid. Add a little muriatic acid, 1/5 ounce to a gallon. Use cold.

The matte dip or satin dip gives an excellent finish and may be used for silver or copper.

Matte Dip

Nitric acid	1 part
Sulphuric acid	1 part
Zinc oxide	½ lb. to a gallon

This solution should be used hot and kept free from water or chlorides. If it cannot be heated easily it may be used cold but it will not work as effectively or as quickly. The matte may be made coarser by adding more nitric acid, or finer by adding more sulphuric acid.

To Remove Fire Scale from Silver

Nitric acid	2 parts
Water	1 part

To mix this solution add the acid to the water. This should always be done as the water neutralizes the acid as it enters the water. If water was added to the acid the small amount of acid would make the water heat and often spatter on the hands or clothing. Use this solution hot and heat in a copper pan made of heavy gauge copper. Dip in water.

Bright Dip for Silver

Nitric acid	4 parts
Sulphuric Acid	8 parts
Water	1 part

To mix this solution add the nitric acid to the water and then add the sulphuric acid. To this solution add a little hydrochloric acid, one tenth of one per cent of the total volume, to be exact. Use this solution cold. Dip in clean water to remove solution.

The common solution used generally by silver workers is effective on small articles such as rings and the like. Mix one part of sulphuric acid and 10 parts of water. Heat in a small copper pan until the metal is white and free from fire scale. Always remove silver from the solutions with a pair of copper tongs. Iron will cause a slight copper deposit on the silver. Dip in water to remove acids.

Silverware of any kind, unless it is the new metal that does not oxidize, will tarnish quite readily. Black silver sulphide forms on silver when it has been exposed to any sulphur compounds. One of the most common examples is when an egg is eaten with a silver spoon. The end of the spoon turns dark due to the sulphur in the egg. One of the common methods used to clean silverware is the electrochemical or galvanic procedure used in the home. Mix a mildly alkaline solution that does not contain silicates, in an aluminum pan. When the silver contacts the aluminum in the hot solution the tarnish is speedily removed.

Aluminum may be cleaned effectively by making a solution of caustic soda, 4 ounces to a gallon of water. Heat the solution and insert the aluminum article leaving it in the bath until it is covered with gases. Remove and rinse in cold water and dip in another solution made of 1 part nitric acid and 1 part water. This solution will make the aluminum white. Rinse again in cold clean water.

The Coloring of Metals with Chemicals

One of the easiest and most successful colorings for copper is obtained with *potassium sulphide*, commonly called liver of sulphur, and water. One ounce of liver of sulphur dissolved in a gallon of warm water is considered a good formula. To this amount add four or five drops of strong ammonia to make the solution act quicker and more efficiently, and to give the metal a richer color. For smaller amounts it will be necessary to measure the water in a graduated measuring glass, and to weigh or estimate the amount of liver of sulphur to use.

Heat sufficient water to cover the article to be colored using a porcelain or enameled pan. Add the liver of sulphur and ammonia and dip the article in the solution. Light shades are obtained by short immersions while darker shades are obtained by longer immersions. The temperature of the water also effects the shade of the metal.

The article should be prepared for the sulphide solution by cleaning it in the bright or matte dip. Remove and rinse in cold clean water and immediately dip it into the sulphide bath before the air has a chance to oxidize it. Handle the article with care so that no finger marks are transferred to the metal surface. Dip in the coloring bath until the desired color has been reached. A hot solution will give a deeper color while a lukewarm solution will give lighter colors. Time of immersion will also alter the depth of color.

Remove the article from the coloring bath,

dip in clean cold water, and start to high light the surface of the metal with fine steel wool. Do this operation while the metal is in the water. If the surface of the metal is kept wet a better coloring will be obtained. To dry, insert the article in clean maple or boxwood sawdust. Sawdust should be free from resinous gums which tend to discolor metal. Change the sawdust occasionally because it absorbs dirt and other foreign materials. Lacquer the article with clear lacquer made for the metal being used. The lacquer should be thinned about half with lacquer thinner. If a spray is available it should be used; otherwise a good fine-haired lacquer brush will do the work.

Copper articles such as mailboxes, lawn signs, lanterns, and other out-of-door fixtures, may be given a green color or *patina*, a term used to describe the beautiful green colors that copper and copper alloys acquire from long exposure to the elements. The Copper and Brass Research Association gives the following formula for developing *verdigris* or green patina on copper:

Saturated copper nitrate solution	1 oz.
Acetic acid — 20 per cent	10 oz.
Sal ammoniac	½ oz.

The saturated copper nitrate solution is made by adding copper nitrate crystals to water until the water will not dissolve any further crystals.

The resulting solution is applied to the surface with a brush and allowed to dry. Sufficient applications at one- or two-day intervals should be made until the desired effect is produced.

Copper bracelets may be made if the back or wearing side of the bracelet is given a coating of silver or if it is silverplated. A silver paste may be made that will give a sufficient coating to the copper when rubbed on with a cloth.

Nitric acid — weak	1 oz.
Silver scraps	1 oz.

Have the nitric acid just strong enough to dissolve the silver scraps. Place the silver scraps in a dish containing the acid. When the silver has all dissolved add sufficient cream of tartar to make a paste. Apply this paste to the copper with a soft rag. When dry lacquer with a silver-water-white lacquer.

Silver nitrate	3 pennyweight 7 grains
Common salt	40 grains

These measurements are Troy weight. Make a paste of the silver nitrate with water. Use glass rod to stir as the silver nitrate is poisonous. Add salt. Add sufficient cream of tartar to make a paste and rub the mixture on the copper with a soft rag. Wash in water. Dry and lacquer with a good silver lacquer.

In either case the copper must be chemically cleaned by a bright dip before the silver mixture is applied.

If one wishes to experiment with other solutions the following are listed in *Platers' Guidebook* published by Metal Industry. The royal copper finish may be produced by lead plating the article and then heating to a dull red heat. The solution is made up of 6 ounces of caustic soda dissolved in 2 quarts of water to which 2 ounces of litharge (lead oxide) is added. After the solution has been boiled for 15 or 20 minutes it is cooled and then filtered. Sufficient water is added to make a gallon of the solution. Lead anodes are used with 1 or 2 volts. Plate for 4 or 5 minutes; then remove the article and dry.

The metal is heated to a red color after lead plating. This may be done with a large blowtorch or, if the article is small, a bunsen burner may be used. Allow the metal to cool and then buff with a soft wheel and rouge to bring out the red copper color.

Various shades may also be produced by using the following solutions hot or cold:

Solution No. 1:	
Copper sulphate	8 oz.
Potassium permanganate	1 oz.
Water	1 gal.
Solution No. 2:	
Copper sulphate	4 oz.
Copper acetate	2 oz.
Potassium chloride	6 oz.
Water	1 gal.
Solution No. 3:	
Yellow barium sulphide	1 oz.
Water	1 gal.

From *Platers' Guidebook*

Coloring Brass

Brass is sometimes used for shop projects such as ash trays, book ends, wall sconces, and decorative plates or trays. One of the best solutions for coloring brass is as follows:

Hyposulphite of soda	8 oz.
Lead acetate	4 oz.
Water	1 gal.

The hyposulphite is the hypo used for photographic work. This solution is used hot in an enameled dish or pyrex glass dish. The length of immersion controls the colors. Dip in clean cold water, high light with fine steel wool or use a fine wire brush. Dry in sawdust and lacquer. Make new solution daily.

Projects that are to be used out of doors may be colored a good green by using the following solution:

Hyposulphite of soda	8 oz.
Nitrate of iron	2 oz.
Water	1 gal.

Use this solution hot. Immerse the article and let it stand to dry. Stipple the solution on areas that are not fully covered. Lacquer, when dry.

Coloring Silver

Silver jewelry may be colored or oxidized to give contrast. The dark oxidized parts bring out the center of interest in a pin, ring, or brooch. There are several solutions for obtaining oxide colors on silver but they cannot be used until preliminary cleaning has been done.

In jewelry pieces all of the borax used in soldering must be removed by pickling the metal in a solution made of sulphuric acid 1 part and water 40 parts. Any polishing compound grease must also be removed with a detergent such as has been already suggested. Rinse the article in clean water and do not touch with the hands before dipping into the coloring solution. A fine copper wire attached to the work will make handling safe.

If the silver article has a stone setting that is hard the article may be dipped into the solution without harming the stone. If the stone is soft, however, it may be affected by the chemical. To be safe it is better to color the metal with a brush and then scratch brush with a fine wire brush or use a toothbrush and some fine polishing abrasive such as whiting, fine pumice stone, rottenstone, or rouge in powder form. After the work has been high lighted it is dipped in clean water to clean off the excess cleaning material.

Blue color on silver: Use a metal box with cover. Hang the silver article on a copper wire from the cover. Place a little sulphur in the bottom of the box. Place cover on box. Heat until the fumes of the sulphur color the metal. High light and lacquer if desired.

Blue-black on silver:
Potassium sulphide.....Size of a pea
Water (hot) .....to cover article

Immerse the silver article or paint on with a brush. High light, rinse in hot clean water, and dry.

Gray on silver:
Platinum chloride ..... Small amount
Alcohol sufficient to dissolve the platinum chloride

Paint on the solution with a brush and dry. High light with a fine scratch brush or toothbrush and fine pumice stone.

Coloring Aluminum

Aluminum is one of the most difficult metals to color in the school shop. It may be colored by an electrolytic process but since the process is covered by patent it is not used except by commercial firms who specialize in the *Alumilite* process.

One of the finishes for aluminum that may be used in the school shop is accomplished by hammering the metal while it is covered with a fine layer of soot. Although this does not come under chemical finishes it is given here so that a form of aluminum finish may be included in this article.

When the aluminum is planished part of the black deposit is hammered into the surface of the metal, giving an effect suggestive of wrought iron. The high raised portions are high lighted with fine steel wool or very fine emery cloth or emery paper. Lacquering with a thin lacquer will protect the metal and hold the color.

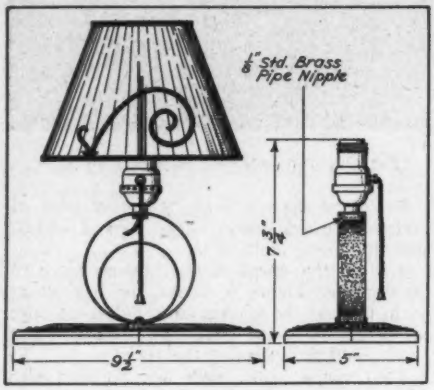
DESK LAMP

A. W. Dragoo, Illinois State Normal University
Normal, Illinois

The desk lamp illustrated and described herewith, has proved itself a very popular project in our general-shop classes in the University High School. The project combines woodwork, metalwork, and electricity, thus bringing into use the experiences gained in several general-shop units. The lamp shown has its metalwork of copper mounted on a mahogany base. The electric socket is the

Desk lamp

standard nickelplated chain-pull socket. To make the finish of the socket conform to the rest of the lamp, it was electroplated with



Assembly of desk lamp

copper in our electric shop. The common copper-sulphate process was used. When complete, the lamp should be given a coat of clear lacquer.

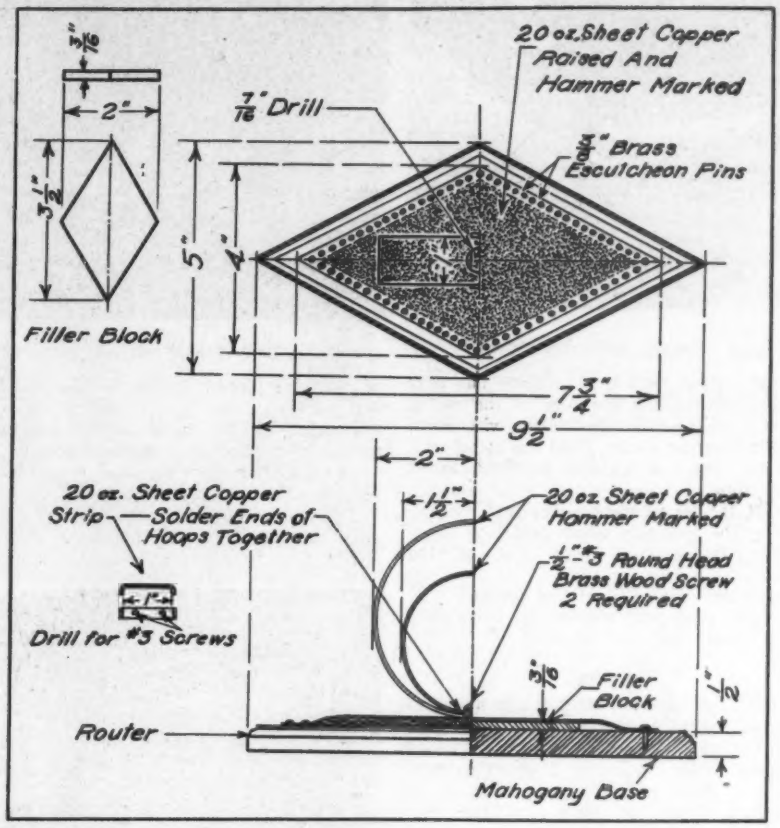
ADJUSTABLE STARTING BLOCKS

A. Minton,
Chaffey Union High School,
Ontario, California

At a recent track meet held at our school, in which the athletes from thirty schools took part, much time was lost in starting the many heats because each boy wanted to dig his starting holes to suit his own particular style.

To overcome this loss of time, the starter suggested adjustable starting blocks. With this idea in mind the boys in the first year of woodshop have constructed several pair of the blocks, illustrated herewith. They may be adjusted by simply loosening a wing nut. They can also be changed to suit a runner who starts with left foot forward.

They have proven to be very satisfactory and runners seem to like them.



Details of desk lamp

TO MAKE A FOLDED TIN BOX

R. W. Wagner,
St. Paul, Minnesota

Write out a job plan for making the box in your notebook. Show it to the instructor.

Cutting

Metal will be supplied to you cut to the right *width*. You will measure and cut to *length* only. Get the metal from your teacher.

Look at Figure 1. Hold rule on edge when measuring. Begin measuring at the one-inch division, not at the end. Use a scratch awl, for marking on metal, not a pencil. Make only one mark with a scratch awl; don't go over the mark a second time.

Look at Figure 2. Use a square for squar-

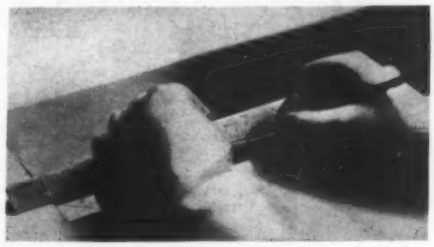
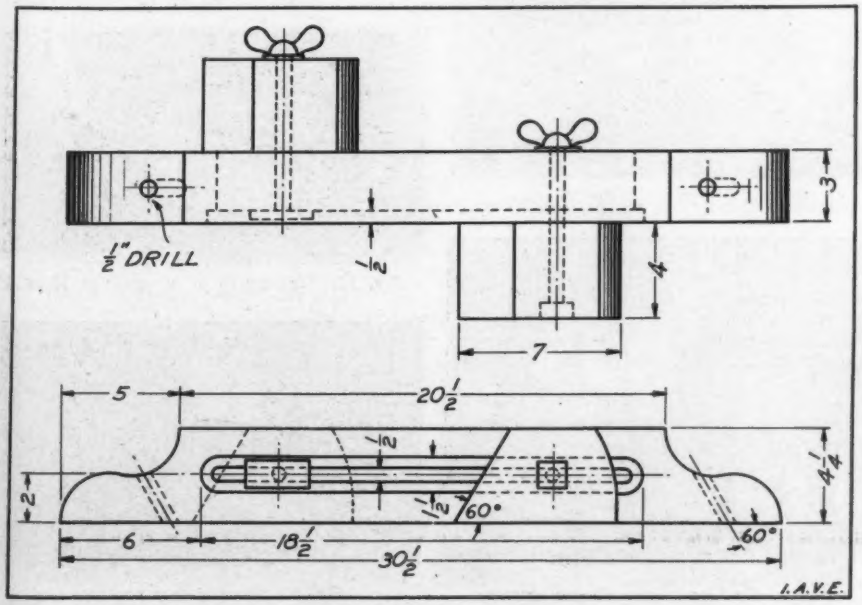


Fig. 1. Using rule and scratch awl

Fig. 2. Using square and scratch awl



Adjustable starting block

Fig. 3. Cutting with straight snips

ing; don't guess with a rule. Have one part of the square against the edge of the metal.

Look at Figure 3. Do the cutting with snips, not with squaring shears. Hold the metal with one hand; don't let go and use both hands on the snips.

1. Cut the four corner pieces first.
2. Cut the four side pieces next.
3. Cut the bottom piece. Cut off the corners.
4. Cut the cover. Cut off the corners.
5. Mark your shop number on each piece with a scratch awl and report.

Folding

6. Fold the corners first. Set the gauge as shown in Figure 4. Start at 0 and move to ½ in. Put up the 90-deg. stop (the one with the square end). See Figure 5. Slip the metal under the blade and bring the wing up to the stop. Fold only one piece at a time.
7. Put a single hem on one edge of each

Fig. 4. Setting gauge on bar folder

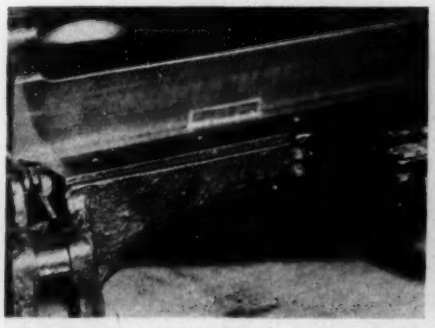


Fig. 5. Folding to 90 degrees

Fig. 6. First step in making single hem

of the side pieces. Reset the bar to ¼ in. and put stop down.

First, hold the metal against the gauge with the left hand as shown in Figure 6.

Second, bring the wing clear over with the right hand as shown in Figure 7.

Third, take out the piece and squeeze the fold between wing and blade as shown in Figure 8.

Fig. 7. Second step in making single hem

Fig. 8. Third step in making single hem

Fig. 9. Folding edges of box bottom

Fig. 10. Single hems on cover of box

8. Put an open hem on the other edge of each of the side pieces. Take steps 1 and 2, just described, omitting 3.
9. Fold the edges of the bottom piece to 90 deg. See Figure 9. Leave the bar set at ¼ in. Put up the 90-deg. stop. Fold each edge in succession to the stop.
10. Fold the edges of the cover.

First, put a ¼-in. single hem on each edge of the cover as shown in Figure 10.

Second, fold these hems up to 90 deg. Leave the bar at ¼ in. and use the stop. Both folds are in same direction. See Figure 11.

11. Report the folding.

Assembling

12. Fit a corner piece into a side piece as follows:

First, force a corner of the corner piece under the single hem as shown in Figure 12. Don't open the hem.

Second, bring the other corner around into the open hem. If corner pieces are too long,

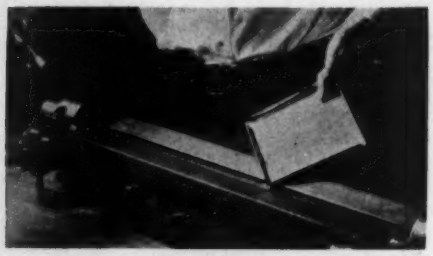


Fig. 11. Hems turned up to 90 degrees

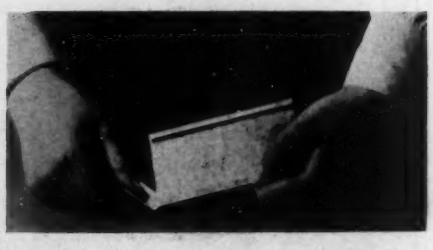


Fig. 12. Starting to fit a corner in place

Fig. 13. First corner in place

Fig. 14. Starting second side

trim off a little without flattening them out. See Figure 13.

13. Fit a second side in place.

First, fit a corner under the single hem as in Figure 14.

Second, fit the other corner into the open hem as in Figure 15.

14. Fit the other sides and corners in place, in the same way.

15. Fit the bottom in place.

First, push the bottom in place so the edges fit into the open hems as shown in Figure 16.

Fig. 15. Second side in place

Second, pinch the open hems tight with pliers, at corners only, as shown in Figure 17.

16. Report the assembling.

Soldering

17. Check out a copper that is well tinned. If there are none, tin one yourself. Remember, you get credit for tinning a copper that needs it. Give the copper time to come to the right heat.

Before applying solder, dust some powdered

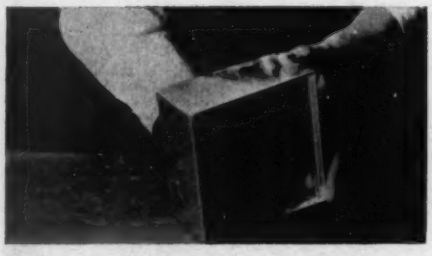


Fig. 16. Pushing bottom in place

Fig. 17. Pinching corners

Fig. 18. Dusting on rosin

Fig. 19. Soldering bottom corner

Fig. 20. Soldering top corner

rosin into the seam as shown in Figure 18.

Be sure to hold the box in the position shown in Figures 19 and 20.

Don't lay the box flat on the bench.

First, solder the bottom corners as shown in Figure 19. Hold the copper on the seam long enough for the solder to soak into the seam. Hold the bottom in place with the thumb.

Second, solder the top corners as shown in Figure 20.

Use as little solder as possible. Let excess run off.

18. Report the soldering.

Finishing

19. If the box is to be used for nails, etc., it need not be enameled. In this case, diagonal creases may be put in the cover as shown in Figure 21.

Fig. 21. Creasing cover

20. If the box is to be used for gift purposes it should be enameled. It may further be decorated with transfer pictures. In this case the cover must not be creased.

Before enameling write the notes on enameling and report them.

21. Report enameling when it is dry.

SAFETY FIRST

He caught his hand, a little thing,
  He hardly felt the sting.
He could not stop for iodine, so —
  Five weeks in a sling.

He ran a splinter in his knee;
  Why, what is that I beg?
He could not stop to fool with that, so
  The Doc cut off his leg!

He got a cinder in his eye;
  Removed it with a knife.
He goes around half blind now,
  But he's glad they saved his life.

He grabbed a piece of foreign wire
  In quite a careless way.
The flowers were very pretty,
  At his funeral, they say.

We're always hoping for the best,
  When we should fear the worst.
It's best to tend the "little things,"
  With "First Aid" and "Safety First."

— National Safety Council, Inc.

NOVELTY BOTTLE TOPS AND PAPERWEIGHTS

Leon H. Baxter,
Association for the Crippled and Disabled,
Cleveland, Ohio

Among the many interesting novelties that a beginner in art-metal work can easily make are various types of bottle tops and paperweights.

Besides being very useful for individual use, they make excellent gifts and party prizes.

Many of these articles can be made from odd waste pieces of metal at very little expense.

Plate 1 shows a number of unique suggestions for novelty bottle tops. These may be made of brass, copper, or pewter, and of any size and thickness desired, although the design should not be overlarge — about 1½ by 2¼ in. for the horse, for example.

Make a neat sketch of the desired size on a piece of paper and cut out roughly with scissors about ⅛ in. larger than the pencil outline all around.

Glue this to the piece of metal decided upon, and with the jeweler's saw cut carefully to the line. See September issue of 1937 INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, for sawing devices and suggestions, on page 285. Finish neatly with a fine file, and round the outline edges to give a pleasing contour to the body.

Sixteen-gauge metal makes a sturdy figure, and be sure to allow enough metal for a spur, about 1 in. long, to penetrate into the top of the cork.

In the writer's classes many of the bottle tops and paperweights were made of pewter, about 3/16 in. thick. This pewter was obtained by collecting and melting all old pewter scraps in a kettle.

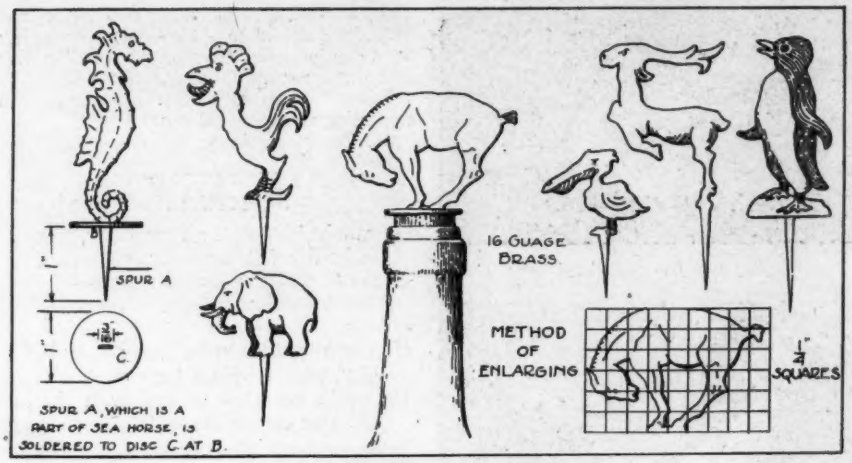


Plate 1. Novelty bottle tops

Make a form similar to that shown in Figure 1. Take a flat, smooth piece of ½ by 5 by 8-in. pine and attach strips of wood about ½ in. wide and 3/16 in. thick, with brads. With the ladle full of the molten pewter, pour slowly and evenly until the form is full. If air pockets develop, fill these with pewter. Allow the metal to cool thoroughly and then remove from the form.

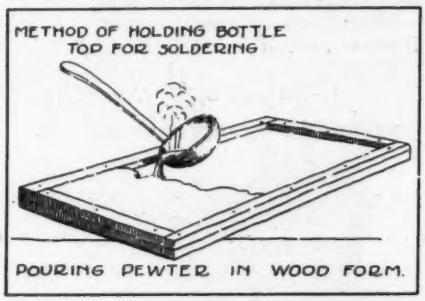
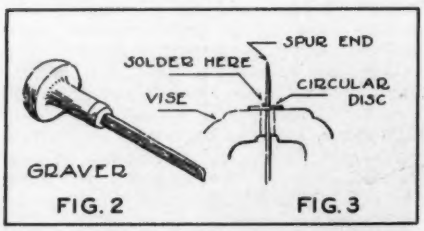


Fig. 1

Glue the design to the pewter and cut out as previously described. File the edges and surfaces smooth and flat, removing all scratches or blemishes. All the shade lines shown on the drawing are cut into the metal with an engraving tool.

Engraving on Metal

Engraving requires a certain amount of skill which is obtained through practice on scrap metal until the ability to use the graver is acquired successfully.



Gravers, like the one shown in Figure 2, can be obtained in various forms and widths of cutting points. The graver is held with the rounded wood handle in the palm of the hand and the cutting edge firmly guided with the thumb and fingers. The tool must be kept sharp and held at an angle that insures best cutting results. Slight, but uniform pressure must be exerted and a pleasing result is obtained by giving the tool a slight twisting motion while applying the pressure.

Pewter, being soft, is much easier to engrave than brass. If brass or copper are used it is well to anneal or heat the metal first to soften it. This is done by heating the metal with a blowtorch. When the various colors that develop on the surface follow the torch as it is moved, it has been sufficiently heated. Pick up with tongs and chill under water, and the metal is ready for use.

(Turn to page 14A)

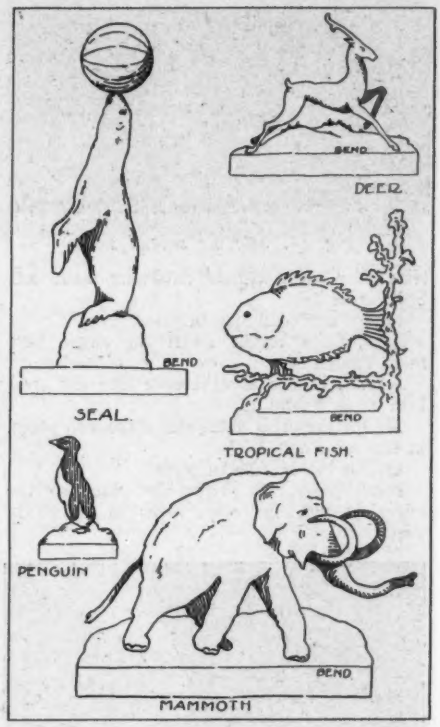


Plate 2

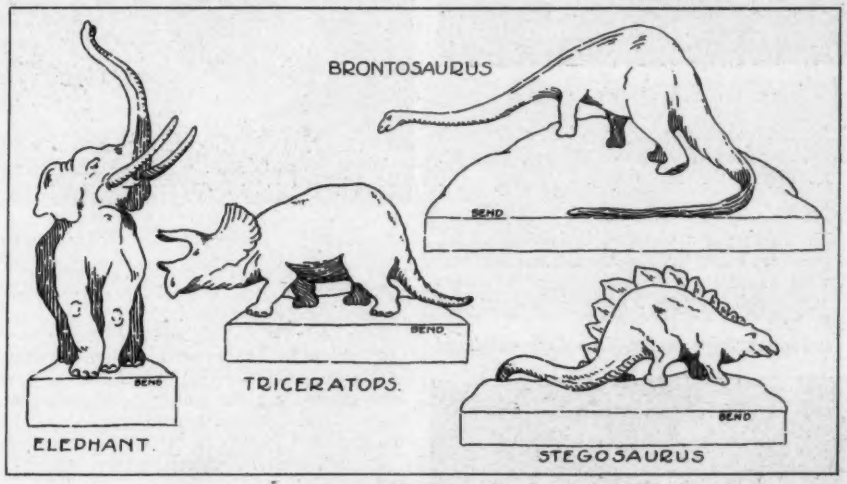


Plate 3

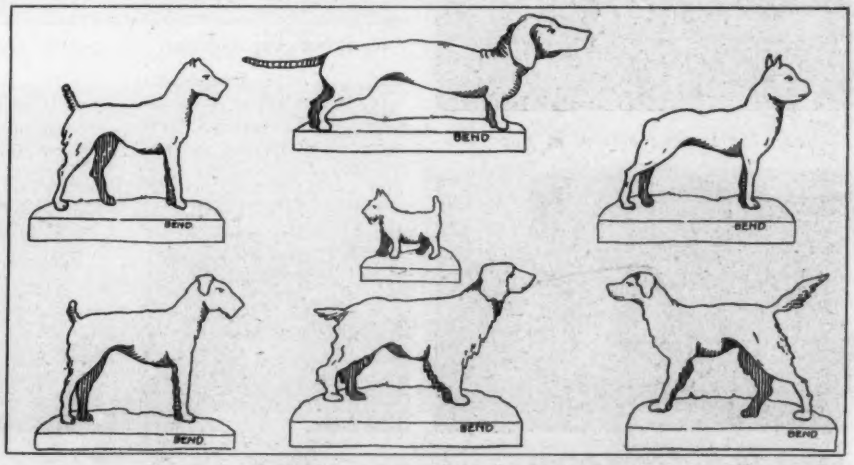


Plate 4. Paperweight suggestions

Hundreds of School Shops are using *Low-Cost Power Tools*

These photographs tell a dramatic story of the revolutionary change that has taken place in shop equipment in schools all over the country. Here are pictured but a few of the many hundreds of shops that have adopted the compact, lower cost Delta power tools as standard shop equipment. Lower first cost is only a part of the explanation—altho it does enable you to equip a shop at a fraction of the cost of heavier machines—or to train two or three times as many pupils within a limited budget. Greater compactness, lower maintenance and operating costs and exclusive basic improvements are additional reasons for the rapid spread of these tools. Finally—students are trained on machines they will actually use after graduation in industrial plants.

Send for Shop Layout Book

Everyone interested in vocational education should have a copy of this remarkable book. It reveals clearly the reasons for the new trend in shop equipment whether for modernizing old shops as well as building new shops. There are actual photographs and floor plans of 30 shops in this attractive 44-page book. These are authentic school shop layouts embodying the most ingenious solutions of the problems of space, safety, lighting, convenience and teaching efficiency in both small and large schools.

DELTA MANUFACTURING COMPANY
(Industrial Division)
600-634 E. VIENNA AVE., MILWAUKEE, WIS.

Delta Mfg. Co. (Industrial Division) E240
600-634 E. Vienna Avenue
Milwaukee, Wis.

Please send me, without obligation, a FREE copy of your new book "How to Plan a School Workshop."

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City ..... State .....

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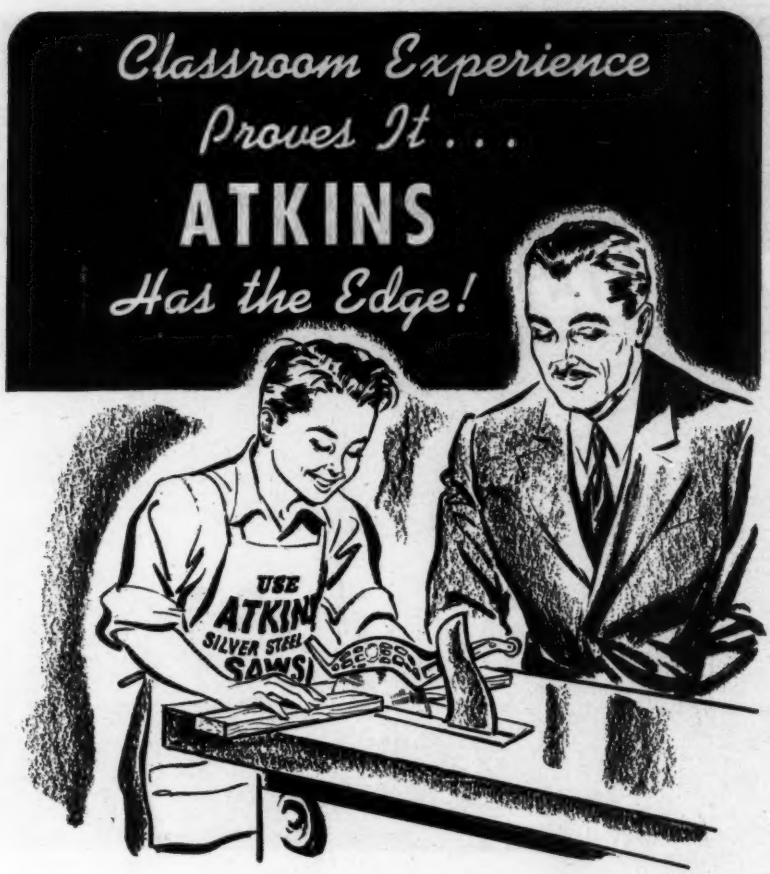


Says the Student: "One of the first things I learned in our school workshop was that Atkins Saws make it easy to cut straight and even."

Says the Instructor: "Atkins Saws are a big help in teaching correct working habits. The teeth hold their set and stay sharp longer, too, in spite of rough treatment by beginners."

Says the Office: "Since we standardized on Atkins we're buying fewer saws and filing expense is 'way down. They're certainly easy on the budget."

These are typical of the many good reasons why Atkins Silver Steel Saws rate high in manual training rooms the nation over.

E. C. ATKINS & CO.

"For Every Cutting Job, Atkins Has The Edge"

Silver Steel SAWS

404 S. Illinois St., Indianapolis, Ind.

Write today for details of Atkins Manual Training Instructors Service (which includes special demonstration and visual aids for loan and other valuable teaching helps).

(Continued from page 84)

Next, cut a circular disk, about ⅞ in. in diameter, or to a size a little larger than the cork on which it is to be used, from sixteen-gauge metal. See detail sketch on Plate 1. At the center, mark a small rectangle the size of the spur at the point that it penetrates the metal disk. Drill a small hole to allow the saw blade to enter and saw out this rectangle neatly so that when the spur is inserted it fits snugly. Figure 3 shows how the two pieces are held in the vise while soldering.

If the design has been made from pewter, special pewter flux is used. This is made from one ounce of glycerine, to which five drops of hydrochloric acid have been added. Pewter solder is also necessary and care must be taken in applying the heat from the torch so that the flame remains only a second at a time on the work. When once the knack of soldering pewter is acquired, it is one of the finest of all metals to solder as the molten solder flows evenly and surely along the patch of the torch, insuring a perfect joint. A suggestion of preliminary practice on two pieces of scrap pewter will not be amiss.

Rub the finished work thoroughly with steel wool. If made of copper or brass, apply either wax, rubbed to a polish, or clear lacquer brushed on while both lacquer and metal are slightly warm.

Novelty Paperweights

Plates 2, 3, 4, and 5 offer a number of interesting designs for paperweights. The prehistoric animals, symbolic of weight, lend themselves to very original designs.

Some of the athletic figures make fine prizes at field meets or for gifts to friends who are ardent baseball fans, swimmers, or fishermen.

Round Paperweights with Weighted Base

The happy pup, shown in Figure 4, is typical of any of the given designs applied on this type of base.

If much pewter work is done in the metal shop it is well to save all scrap pieces and melt them up and pour into forms of various thicknesses.

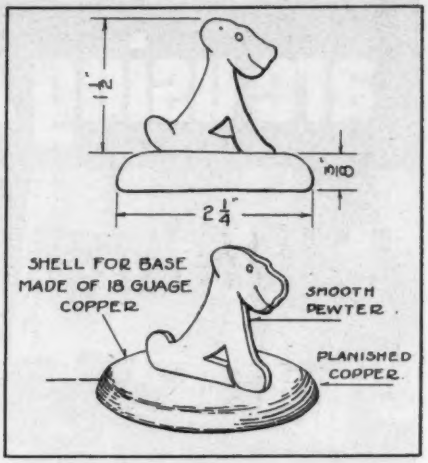


Fig. 4

Fig. 5

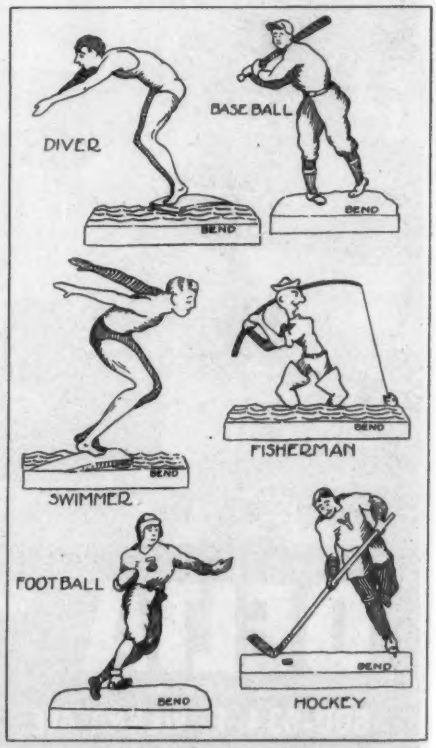
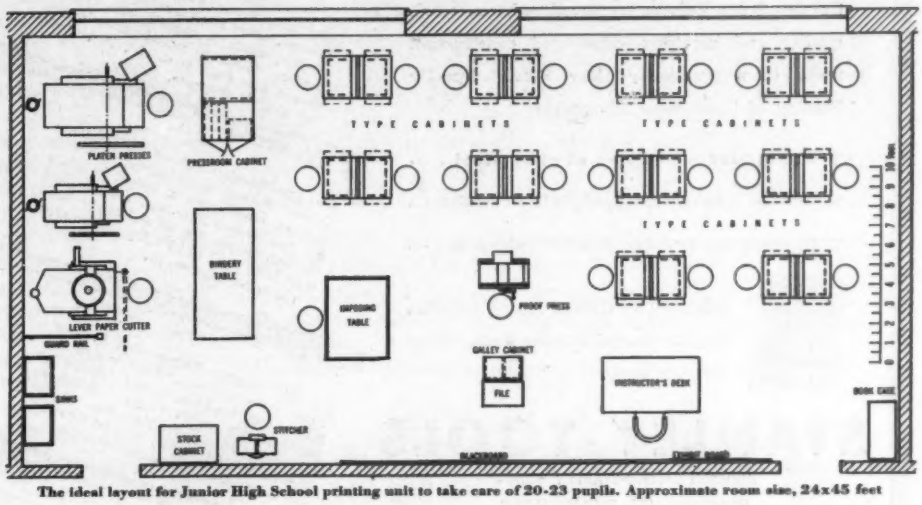


Plate 5. Paperweight suggestions

(Turn to page 16A)

A·T·F School Printing Units

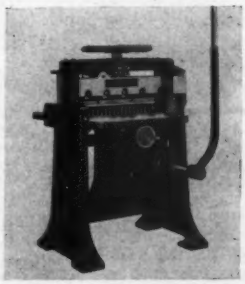
for JUNIOR HIGH...



The ideal layout for Junior High School printing unit to take care of 20-23 pupils. Approximate room size, 24x45 feet

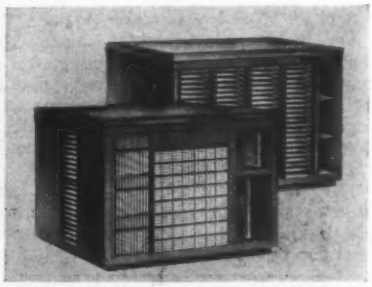
***ATF*'s staff are specialists in laying out and furnishing your School Print-shop with equipment best suited to your needs. Upon request, they will be glad to help you plan your department and furnish, without cost or obligation, a layout for the ideal Junior High School, or other printing unit. Just write them on the letterhead of your school the size of space you have available, the number of students to be accommodated at one time, and the approximate amount of money you wish to spend.**

These are only **a few pieces in the large assortment of Junior High printing unit equipment that ATF carries. Ask your ATF Salesman, or write nearest ATF Branch Office for complete list.**



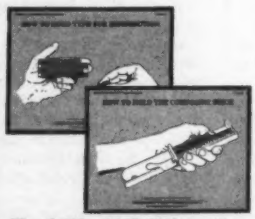
Challenge Lever Paper Cutter No. 265 **• Scientifically designed and simply constructed. Safe, easy to operate and thoroughly dependable**

No. 1 Vandercook Proof Press **• 14x18 inch printing surface. The ideal machine for all hand inking work. Accurate, rigid, accessible**



American School Imposing Table **• Ideal size, height and design for Junior High School unit. Illustrated are both sides and ends of the 51 x 39 inch table**

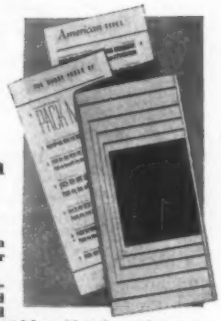
American Ideal School Type Cabinet **• Working space for two pupils at a time. Complete with job and font cases, and lead and slug rack. Seasoned hardwood, varnish finish**



Visual Aids **• 24 Wall Charts illustrating the proper methods of performing the basic operations in printing. Printed on 10-ply cardboard 11x14 inches, suitable for hanging on the wall. Only $2.00 for complete set of 24. Ask your purchasing department to order direct from the nearest ATF Branch office**

FREE!

***Handy Index of* American Types**



American type is known and preferred wherever fine printing is done.

Illustrated is Handy Index of over two hundred American types grouped by style characteristics, width and height, with a pica measure on every page. Just the thing for you to use for handy reference. A copy is yours for the asking.

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STRONG DRIVERS

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★ Machine cross-ground tips hold in screw slots . . .

★ Handles shaped for comfortable grip . . .

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DIVISION OF THE STANLEY WORKS
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No. 1006 – "Stanloid" handle, toughest non-metallic substance known. Blades tempered entire length. Supplied in 4", 6", 8", 12" sizes. The best driver for automotive, machine and electrical shops.
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No. "100 Plus" – Strongest wood-handled screw driver. Forged wings on tang prevent blade from turning in hickory handle which is capped with leather washer. Blade tempered entire length. Seven sizes from 3" to 12". A fine tool for general shop use.
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No. 20 – Stanley "Hurwood" Screw Driver. Forged blade goes all the way through handle and is locked in place by two projecting wings and a rivet through ferrule, handle and blade. Nine sizes from 2½" to 18". A popular driver for woodworking shops.
STANLEY
GENUINE HURWOOD
No. 25 – Stanley Driver with Bolster Type construction. Four wings on bolster lock blade in handle. Blade is tempered its entire length. Handles are deeply fluted for a good grip. Eight sizes from 2½" to 12". A good tool for the woodworking or electrical shop.
STANLEY
STANLEY
TRADE MARK

(Continued from page 14A)

For the base, use a piece of 20-gauge copper about 3¼ in. in diameter. This copper base may be formed in many ways; by spinning the metal over a form, by hammering into a depression, or by raising over a stake. Whichever way is used, the finished shell should be 2¼ in. in diameter and ½ in. deep.

Fill this shell to within ⅛ in. of the top edge, as shown in Figure 5, with the molten metal. Babbittor lead may, of course, be used for this purpose.

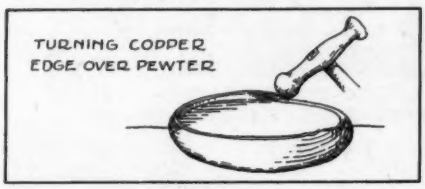


Fig. 6

After the metal has cooled, use a round-headed hammer to turn the copper edge inward over the metal, as shown in Figure 6. This holds the weighted part firmly in place. Turn the piece over and planish all over. See Figure 7.

Cut the dog from 3/16- or ¼-in. pewter previously cast. Smooth the surface and edges with file, emery paper, and steel wool. Accent the few surface lines of head, legs, and mouth with a graver. Use a medium nail set to punch the eye.

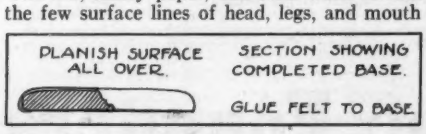


Fig. 7. Round paperweight with weighted base

Solder carefully to the center of base. Glue a piece of felt to the base.

Personal News

♦ Dr. Verne C. Fryklund of Wayne University has been elected president of the National Association of Industrial Teacher Trainers, a group of 500 United States educators interested in teacher-training for industrial arts. The Association, an affiliate of the American Vocational Association, consists largely of professors of colleges of education, and of staff members of state departments of public instruction.

♦ Mr. N. S. Hunsdon, who held the position of supervisor of shopwork in the San Antonio schools for the past six years, retired on September 1, 1939, after 44 years of service in the schools of Texas.

Mr. Hunsdon organized the first manual-training school in Texas in September, 1896, and was head of the work at Austin, Tex., until September, 1908. He then became the director of industrial arts and vocational education in the San Antonio schools.

From December, 1918, to January 15, 1933, he acted as the organizer and director of the vocational-education program in industrial education under the Smith-Hughes Act in Texas. He then returned to the San Antonio schools until his retirement last September.

♦ Mrs. M. Winifred Hurrell, wife of Dr. Arthur H. Hurrell, director of vocational teacher education, The Pennsylvania State College, State College, Pa., died on November 27, 1939.

Mrs. Hurrell was born in Middleton, Va., November 14, 1875. She was a graduate of the University of Pittsburgh and a member of the Pittsburgh chapters of Phi Mu and Pi Lambda Theta societies.

She was actively interested in social welfare and church work.

Interment took place in Buffalo, N. Y., November 29, 1939.

♦ Miss Elizabeth Fish, who founded vocational education at the old Central High School at Minneapolis, Minn., in 1914, and has done valiant work for this form of education ever since, died very suddenly on December 15, 1939.

Due to her vision, hard work, and wise counsel, the new Miller Vocational School will soon be ready to carry vocational education to still greater heights in Minnesota. Unfortunately, Miss Fish was not permitted to see her plans come to full fruition.

♦ Miss Agnes Crounse, faithful co-worker and assistant to Miss Elizabeth Fish, has been appointed principal of the Miller Vocational School, Minneapolis, Minn., to succeed Miss Fish who died recently.

♦ Lucy S. Silke, head of art instruction in the Chicago schools for 31 years, died of a heart attack, Tuesday, November 14, 1939.

Association News

♦ The thirty-third annual A.V.A. convention held December 6–9, 1939, at Grand Rapids, proved to be more successful than its most ardent admirers had hoped.

Registration and attendance at the meetings were both above par, and the programs were uniformly good.

The speakers at the general meetings were well chosen and they all brought messages full of meaning and value.

At the opening session, Ralph H. Woods, President, American Vocational Association, Inc., State Department of Education, Frankfort, Ky., presided, and the main speakers were W. J. Cameron Ford Motor Company, Detroit. Mich., and Ber

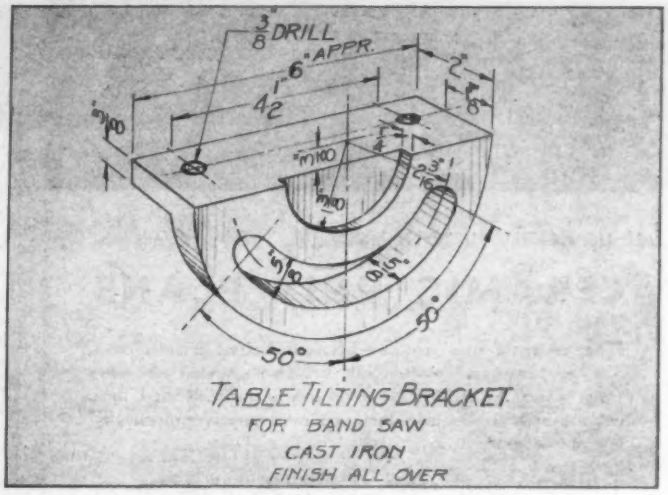
(Turn to page 17A)

PROBLEM 2
FOR CLASSROOM USE

This month the maker of Typhonite Eldorado offers a Table Tilting Bracket whose orthographic views your students may draw. To simplify your work as an instructor, a blueprint, showing the problem's solution, will be sent to you by Dixon upon request.

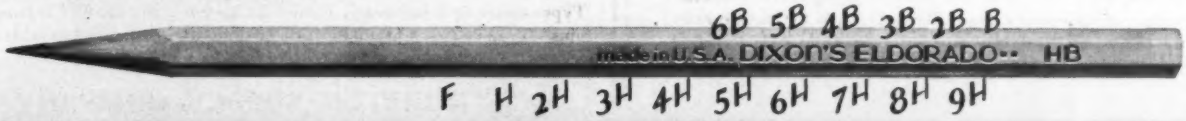
If you are not already using Typhonite Eldorado pencils in your classes, we suggest you give them a trial. You'll find they are perfectly graded, hold their points longer, give off freely and make clean, opaque lines and figures, which are ideal for blueprinting.

One of the reasons for the quality of Eldorado drawing pencils is Typhonite. Typhonite is natural graphite which has been battered into extremely minute particles by a whirlwind or typhoon of dry steam. Typhonite is exclusive with Dixon.



PROBLEM: Students are to draw the correct orthographic views of this Table Tilting Bracket for Band Saw.

SOLUTION: A blueprint of the solution will be sent to any teacher requesting it for comparison with students' drawings, thus simplifying instructor's work. Write to School Bureau, Joseph Dixon Crucible Company, Jersey City, N.Y., for blueprint #128-J2.



SCHOOL BUREAU, JOSEPH *Dixon* CRUCIBLE COMPANY, JERSEY CITY, N. J.

(Continued from page 16A)

G. Graham, Superintendent of Schools, Pittsburgh, Pa., and President, American Association of School Administrators.

A combined sections meeting was held Thursday at 1:45 p.m. at which L. H. Dennis, Executive Secretary, American Vocational Association, Washington, D. C., presided.

At this meeting Charles S. Mattoon, Director of Personnel, Curtiss Airplane Division, Curtiss-Wright Corp., Buffalo, N. Y., described the needs of the industry as well as the opportunities for the workers in aviation in this country.

Other subjects on this program were "Basic Services for American Youth" and "Skilled Workers for the Essential Industries." C. A. Prosser, Director, William Hood Dunwoody Institute, Minneapolis, Minn., summarized the program.

The industrial-arts sectional meetings were all well attended — some to the point of overflowing so that new quarters had to be secured.

The one held at 9 a.m. Thursday, December 7, in which "Industrial Arts and Its Public Relationships" was discussed, was presided over by Roy G. Fales, State Department of Education, Albany, N. Y.

At this meeting Rudolph L. Schwanzle, Supervisor of Practice Teaching, State Teachers College, Pittsburg, Kans., presented an interesting paper on "Pupil Activities Which Win Community Support."

Maris M. Proffitt, Educational Consultant and Specialist in Industrial Education, U. S. Office of Education, Washington, D. C., spoke on "Teacher Activities which Build School-Community Interest," and Edwin A. Roberts, Supervisor of Industrial Arts, Public Schools, Rochester, N. Y., presented plans for "Winning the Support of Industry."

The industrial-arts meeting on Friday, December 8 at 9 a.m. was devoted to the theme, "Some New Developments in Industrial-Arts Education."

Addresses on "Contributions to Understanding Personal Relationships of Industrial Life," "The New Practical-Arts Guide Book Series," "Vocational Guidance Through Arts Orientation," "The Unification of Industrial-Arts Education," "Our New Workshop in the Arts," and "A New Development in Line-Drawing Reproduction" were given, and the speakers were, John F. Friese, Associate Professor of Industrial Education, Pennsylvania State College, State College, Pa.; R. A. Hinderman, Director Special School Services, Denver, Colo.; Paul E. Harrison, Professor of Industrial Arts Education, State Teachers College, DeKalb, Ill.; Walter W. Williams, Development Supervisor, Arts and Industries Building, Public Schools, Oberlin, Ohio; Kenneth Beach, Head, Department of Industrial Education, Louisiana State University; K. F. Perry, Professor of Industrial Arts, Colorado State College of Education, Greeley, Colo.; and Ian MacPherson, Special Representative, A. B. Dick Co., Chicago, Ill.

At the Friday, 2 p.m. session the general shop was discussed. Clifford K. Lush, Supervisor of Industrial Arts, Public Schools, Minneapolis, Minn., at this session made an exceptionally good presentation on the subject of "Multiple-Activity Concept." Other speakers on this program were, A. R. Nichols, Supervisor of Industrial Arts and Director of Vocational Education, San Jose, Calif., Frank C. Moore, Director of Industrial Arts, Cleveland, Ohio, and Maris Proffitt.

Saturday at 9 a.m. the industrial-arts section discussed the place of industrial arts in modern education. Dr. Verne Fryklund, Associate Professor of Vocational Education, Wayne University, Detroit, Mich., presided. Roy A. Hinderman, and F. Theodore Struck, Professor of Industrial Education, Pennsylvania State College, State College, Pa., were the speakers. At this meeting also, Dr. Homer J. Smith, A.V.A. Vice-President representing Industrial-Arts Education, made a report of progress on the work done by the industrial-arts section.

Arthur L. Reagh, Director of Industrial Arts, Grand Rapids, Mich., was chairman at the industrial-arts luncheon held Saturday, 12:30 p.m. He introduced Earl L. Bedell, Director of Vocational Education, Detroit, Mich., as Toastmaster, and he in turn, presented Dr. Bess Goodykoontz, Assistant Commissioner of Education, U. S. Office of Education, Washington, D. C., who captivated her audience by her address, "Search for Reality."

At the A.V.A. banquet on Thursday, Ralph H. Woods presided. Among those who were honored with life memberships to the A.V.A., probably no one received more acclaim than Tom Diamond to whom the membership was presented by the many friends he has made as Professor of Vocational Education at the University of Michigan.

Paul V. McNutt, Federal Security Administrator, Washington, D. C., was the main speaker at this event.

The annual dance followed.

There were, of course, just as many or more meetings held by each of the other sections — agricultural, business, home economics, industrial education, part-time schools, vocational guidance, and vocational rehabilitation. No one observer could do justice to them all.

Besides the meetings, there were numerous breakfasts, luncheons, and dinners held by various groups, schools, and fraternities.

The Ship, represented by more than 60 commercial exhibitors, gave its usual entertainment Friday at 9 p.m. Besides presenting entertainment, which is always well received, and distributing many valuable prizes, the Ship publicly honored the lately retired editor of the *Industrial Education Magazine*, and beloved leader and historian of industrial arts and vocational education, Charles Alpheus Bennett, with the following citation:

In Appreciation of
Charles Alpheus Bennett
of Peoria

Outstanding figure through a half century of marked advance in education; devoted specialist in industrial arts and all related realms; modest initiator of a score of means to steady growth and real improvement; friend and colleague of effect and charm; sound of judgment; calm and

(Turn to page 19A)

POTTERY

Let us help you with your

CERAMIC UNIT PLANS

More ceramic units are now being installed in Industrial Arts departments—especially in the general shops—than ever before. This trend has been accelerated to a definite degree by the introduction of inexpensive, economically operated equipment.

There are Amaco supplies and equipment available for every ceramic purpose. In addition to seven different sizes of electric kilns you have a choice of eight gas and oil kilns. Six potters' wheels include both electric and those operated by foot power. Amaco clays, glazes, and other supplies work perfectly in conjunction with each other to assure either the experienced or inexperienced potter of perfect results.

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To All Industrial Arts Instructors
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A few of the items we show: Chest hardware, locks, hinges, supports, casters, copper trim, etc., also mldgs., overlays, etc. Finishing materials, glue, stains, varnish, wax, flint and garnet papers, rubber sanding blocks, stick shellac, burning-in knives, etc. Upholstering supplies and coverings. Complete line of electrical findings for lamp manufacture, also cluster and indirect fixtures. Chair cane, woven and in strands, spline, reeds, fibre cord, etc. Trays for smoking stands and glass liners. Large line electric and spring clock movements, with and without dials. Complete line Venetian Blind hardware, tapes and cords. Table slides and leaf supports. Tea wagon wheels and casters. Wood dowels, also dowel screws, dowel centers, wood screw hole buttons. Excellent line card table leg supports. Bed hardware of every description. Desk pens, complete with funnel and fastening, without base. Water transfers, inlays, small mouldings, etc. Furniture glides and casters, office chair spiders, wood legs and K. D. chair frames. Small box hardware of every description. Large selection pulls, knobs, handles, hinges, locks, catches, etc. Perforated steel panels, chair braces, revolving chair fixtures, rocker springs, candlestick sockets, bill board clamps, banquet table equipment, many sizes braces, corner irons, hanger bolts. Step ladder braces, pilaster strips, sliding track and sheaves. Typewriter desk hardware, binswings, mirrors. nut bowl hardware. Bar pins for novelties. Catalin Plastics. Crib hardware, swivel top table fixtures, sectional bookcase hardware, clamp nails, electric pens for burning, etc.

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MADE BETTER TO WORK BETTER

Gardiner quality Flux-Filled Solders help produce neater, better work. Easy to use and most economical because of uniform quality of the solder and the exact amount of flux. Preferred and recommended by instructors, industrial plants, mechanics and farmers everywhere. Sold by hardware, auto accessory and mill supply dealers. Gardiner's modern methods permit low cost without sacrifice of quality on flux-filled solders, bar and solid wire solders, babbitts and casting metals. Packaged conveniently for household, shop and factory needs. *A generous free sample will be sent to instructors on request.*

Gardiner METAL CO.
4922 S. CAMPBELL AVE., CHICAGO, ILL.

NEW Visual Aid Immensely Popular

Immediate Response Most Gratifying

Yes, so many of you Instructors in Industrial Arts and Vocational Education have asked for our new Wall Chart of Metal Working Abrasives that we're working overtime to get them in the mail and delivered on schedule.

While there are plenty available for the present, may we suggest that if you are one of those who have not yet sent in for a copy — or for any of the preceding units in our Coated Abrasives Educational Program — you do so at once. There was a coupon for your convenience on page 3A in the December issue of this publication. We hope you'll make use of it. Or you can write us on your school letterhead.

1A20

BEHR-MANNING
Educational Service Department
TROY, N. Y.

Reliable Sandpapers Since 1872

(Continued from page 17A)

cordial; serving with margin as few men can; generous beyond our knowing; of unmatched energy and care; teacher, scholar, author, artist; acknowledged historian of our movement; editor and publisher without a peer; wise counselor; keen and constant critic; and, withal, yet best of all, a dependable kindly gentleman.

These truths and sentiments
entertained by a host of professional admirers
are offered in record by
The Ship
in open meeting at the
Thirty-Third Annual Convention of the American Vocational Association,
Grand Rapids, 1939

In the absence of Mr. Bennett, the citation was presented to Dr. William T. Bawden, Kansas State Teachers College, Pittsburg, Kans., with the request that he forward it to Mr. Bennett.

The Ship also transferred the rank of "First-Class Passenger" on Dr. Homer J. Smith.

Ed Cherry, pioneer sales representative of The Stanley Works, was introduced and congratulated on the completion of his 50th year of service, much of which was spent in the cause of industrial arts and vocational education.

At the House of Delegates meeting, Friday, 7:45 p.m., the following officers for the coming year were elected: *President,* Dr. Robert O. Small, Director of Vocational Education of the State of Massachusetts; *Treasurer,* Charles W. Sylvester, Director of Vocational Education, Baltimore, Md.; *Vice-President for Agricultural Education,* Fred A. Smith, Arkansas State Director of Vocational Education, Little Rock, Ark.; *Vice-President for Home Economics,* Miss Florence Fallgatter, Head of Home-Economics Department, Iowa State University; *Vice-President for Part-Time Schools,* O. D. Adams, Oregon State Director of Vocational Education, Salem, Oreg. Five other departmental vice-presidents hold over in office.

The next meeting will take place in San Francisco.

♦ The symposia, or clinical plan will be the keynote of the Nineteenth Annual Conference on Printing Education, to be conducted by the National Graphic Arts Education Guild at the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., next summer.

Lists of questions covering matters pertinent to teachers of layout, type composition, related subjects, and presswork will be distributed to the 600 members of the Guild this month. These lists will be the bases for discussions which will be conducted by the members themselves. The plan will enable the teachers to take home with them the recommendations of the organization concerning problems which have been troubling teachers for many years. It is expected that improvement will result in teaching methods and conditions generally.

The annual banquet will feature a celebration of the 500th anniversary of printing from movable types. R. Randolph Karch, local conference chairman and regional vice-president, announced that all local printing teachers will form a committee to conduct the conference.

♦ The National Council of Teachers of Mathematics will have its 20th annual meeting in St. Louis, February 22, 23, 1940. The theme of the meetings will be "Mathematics for the Other-Than-College Preparatory Student." All phases of this theme will be discussed in the four divisions of the meetings: I, General Meetings; II, Elementary-Schools Program; III, Secondary-Schools Program; and IV, Teacher Education Program.

Questions relative to any phase of this meeting should be directed to 525 West 120th Street, New York City.

♦ The Vocational High School Teachers Association of New York City held its annual luncheon on January 13 at the Hotel Commodore. At this meeting the association presented its merit medallion to Mr. Morris E. Siegel, Director of Evening and Continuation Schools in the City of New York, for outstanding services to vocational education. Among those who attended were Assemblyman, Robert Wagner, Jr.; Superintendent of Schools, Harold G. Campbell; President of the Board of Education, Mr. James Marshall; Associate Superintendents, Grady and Burke, and other educational leaders.

♦ The Eastern Pennsylvania Industrial Arts Conference will be held on Saturday, April 27, 1940, on the campus of State Teachers College, Millersville, Pa.

♦ The Texas State Teachers Association meeting in San Antonio, November 30 to December 2, included numerous sectional meetings in the field of practical arts as well as the annual vocational breakfast sponsored by the T.V.A. Among the Sectional Programs were those devoted to art, distributive vocational education, commercial, guidance, home economics, industrial arts, trades and industries, vocational agriculture, and the Texas Vocational Association.

Dr. Verne C. Fryklund, supervisor of vocational education, Wayne University, Detroit, Mich., was the guest speaker for the practical-arts groups. Dr. Fryklund also spoke at various sectional meetings on the subjects of "Significant Trends in Industrial Education," "Ways and Means of Promoting the Industrial Arts," "Effective Teacher Training in Vocational Education," and, before the T.V.A., on "The Scope of Vocational Education in Our Schools of Today." All of Dr. Fryklund's addresses were well received and the attendance was record breaking.

The industrial-arts group, under the direction of Prof. Victor Randel, State Teachers College, Huntsville, conducted a forum related to the ways and means of promoting industrial arts in Texas communities. Short contributions to this theme were given by: Jim Ramsy, Marshall; McKee Andrus, Lovenberg; Thomas Maxwell, Galena Park; and H. K. Dodgen, Temple. Professor C. E. Rowe, University of Texas, also spoke on, "Visual Aids in the Teaching of Drawing" and illustrated his lecture with models used in the effective teaching of projection, intersections, auxiliary views, etc.

The trades and industries group, with Charles A. Johnson, Houston, as chairman, discussed problems concerning the future of the trades and

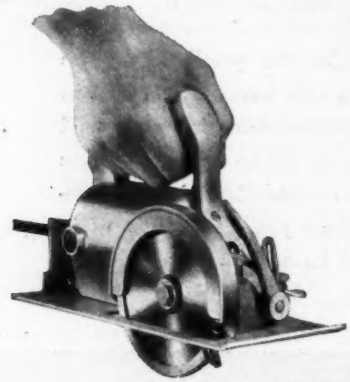
(Turn to page 25A)

ADVERTISING PAGES REMOVED

SHOP EQUIPMENT NEWS
NEW PRODUCTS — PUBLICATIONS

The GuildCutter

This new electric tool has just been put on the market by the Syracuse GuildTool Company, Syracuse, N. Y., manufacturers of the *Guild-Sander*. It is a light, portable tool designed to cut material up to 1¼ in. thick, and is especially useful on wood, plywood, celotex, masonite, and other building materials. Equipped with a 4½-in. saw blade the *GuildCutter* has a wide range of uses. The saw arbor also provides for the use of a ¼-in. width dado head for ploughing, grooving, tenoning, and dadoing.



As the base of this machine quickly raises and lowers, any depth cut from a mere scratch to the full 1¼-in. capacity may be made. The base also tilts to 45 deg. for beveling. A telescope-type guard protects the blade at any angle.

The GuildCutter frame is cast aluminum alloy, with high polish finish. The complete tool is 11¼ in. long, 8 in. high, and 4½ in. wide. It weighs only 7 pounds.

Power is supplied by a universal, 110-volt motor, that operates efficiently from any 110-volt A.C. or D.C. outlet. It is an efficient, high quality tool yet built to sell at a popular price through hardware, mill supply, and building supply dealers everywhere.

Graph Papers

Eugene Dietzgen Co., manufacturers of drafting and surveying supplies, Chicago, Ill., announces a broad and comprehensive line of Graph Papers for mathematical, commercial, and industrial use. The line includes "same division" and "different division" sheets, with a wide range of divisions;

security price sheets; logarithmic and semilogarithmic sheets in varying divisions, sizes, and weights; mathematical sheets in circular percentage, isometric, polar, and triangular co-ordinates; time element sheets for periods from one day to 5 years.

The line is built on Dietzgen's long familiarity with the needs of this field. The sheets are printed from deep-etched litho plates and are absolutely accurate and uniform. The paper is high-grade rag-content bond, tough, transparent, light in weight. Some are available in medium-weight drawing paper. All are printed in a special olive-green ink, which has been found to be easiest on the eyes. Drawings stand out specially well on this ink. Sheets are punched with 5 holes for standard 2- or 3-ring binders.

Miniature Reversible Ratchet

Armstrong Bros. Tool Co., 322 N. Francisco Ave., Chicago, Ill., announces a new miniature reversible ratchet and four new drivers for their miniature detachable head wrenches. The reversible ratchet is only 4 in. long. It is machined from special chrome vanadium steel, and is finished in chrome plate The ratchet is of improved design with hardened gear and instant reversing thumb switch. The other four miniature drivers added to this series are: flexible head handle, a screw-driven-type extension spin grip which permits locking head so that it can be used also as a spinning extension, and long and short extensions.

Photochemical Printer

Basic new equipment for the industrial arts has recently been announced by A. B. Dick Company, Chicago, makers of the Mimeograph duplicator. This new equipment, the Mimeograph photochemical printer, provides a new method of reproducing drawings, tracings, plans, graphs, and music in quantities, quickly, accurately, and economically.

Photochemical printer

Chief element of the compact printer is a new type of brilliant "cold" light, evenly distributed through tubing surrounded by a transparent plastic cylinder. By means of this light, any opaque drawing on translucent cloth or paper can be transferred to a special stencil sheet. The stencil sheet is then developed and placed in the Mimeograph duplicator for black-and-white reproduction in quantity.

Included in the original assembly are printer, developing plate, and all necessary accessories except chemicals and stencil sheets.

Super Kamex Varnish

Super Kamex is a new product announced by the M. L. Campbell Company, of Kansas City as combining the best feature of varnish and lacquer. It is a clear varnish with the following unique characteristics:

It dries dust free in 5 minutes, and hard enough to sandpaper or rub in one hour.

It is as tough and durable as any good furniture varnish, and will take a polish or dull rubbed finish.

It is waterproof, resistant to alkalis, and its finish is not injured by liquids containing a considerable percentage of alcohol. It is not, however, resistant to pure 188 or 190 proof alcohol.

If thinned 5 to 10 per cent with turpentine, it brushes better than shellac or brushing lacquer, but to get the best results, it should be applied with a spray.

It has a very high solid content, and one coat is equivalent to two coats of clear patented lacquer.

Having all of the good qualities of both lacquer and varnish, it is recommended as an ideal product for furniture finishing and refinishing.

It is nonlifting, and can be applied to any surface.

Super Kamex is made in clear gloss, semigloss, and flat.

Ed Cherry Honored

Mr. E. A. Cherry, commonly known as Ed Cherry to the thousands of industrial-arts and vocational-education teachers, celebrated his fiftieth anniversary with the Stanley Works, New Britain, Conn., on Sept. 9, 1939. He was presented with a fifty-year service pin on this occasion by M. A. Coe, vice-president and general manager of the Stanley Works.

Mr. Cherry started as errand boy for the firm on September 9, 1889. From this position he was promoted to the post of salesman, calling on the

E. A. Cherry

hardware trade in New York City. His success at this work procured for him the appointment as sales representative of the firm with a territory which covered everything east of the Mississippi River.

Since 1932 all of his time has been devoted to the educational field and his territory embraces all that part of the United States which lies east of the Rockies.

The constructive thinking which Mr. Cherry has brought to the solution of the many problems in the school-shop field of this country, his earnestness, his abiding good humor, his affability and wholehearted friendliness, have endeared him to thousands of school-shop teachers, supervisors, and executives. It gives INDUSTRIAL ARTS AND VOCATIONAL EDUCATION and its many readers pleasure, therefore, to congratulate Ed Cherry, this dean of manufacturers' representatives in the fields of industrial arts and vocational education, and to wish him well for many more fruitful and successful years to come.

THE JOHNSON GAS APPLIANCE CO. of Cedar Rapids, Iowa, has just completed its new 16-page catalog. It is 8 by 11½ in. in size, includes pictures and describes the complete line of Johnson Gas appliances for domestic, industrial, and commercial uses.

A heat color chart, and tables of capacities and orifice sizes for tank and bottled gases have been appended. A complete line of burners, torches, furnaces, and conversion burners are shown.

Anyone wishing a copy of this catalog may have it by writing the Johnson Gas Appliance Co., 522 E Ave., N.W., Cedar Rapids, Ia.

CATALOG NUMBER 40, giving complete information on Atlas machine tools and equipment for 1940, has just been released by Atlas Press Company, Kalamazoo, Mich. Several new attachments and accessories are announced along with the year's design improvements in Atlas lathes, drill presses, arbor presses, and shapers. Copies are free on request (address Dept. 7).

WILLIAM DIXON, INC., Newark, N. J., have recently issued a new booklet entitled "The Dixon Manual" for artisans in wood and metal. It contains step-by-step instructions for making 21

(Turn to page 23A)

BRODHEAD-GARRETT CO.

Announces

A 250-WORD ESSAY CONTEST

In Connection With Their Famous

"Soft-Texture" **KILN DRIED LUMBER**

(Used in Schools in 45 States from coast to coast)

This contest is open to all directors, supervisors, and instructors engaged in the fields of Industrial Arts and Vocational Education in the United States subject to the following rules:

1. Write a brief essay of 250 words or less on the subject—"WHY I PREFER 'SOFT-TEXTURE' KILN DRIED LUMBER FOR USE IN MY CLASSES."
2. Submit entries in sealed envelope marked "SOFT-TEXTURE LUMBER CONTEST."
3. All essays will be the property of BRODHEAD-GARRETT CO.
4. In fairness to all, BRODHEAD-GARRETT CO., will not enter into correspondence with anyone in connection with this contest.
5. This contest will close April 1, 1940, and winners will be announced as soon as the judges make their decision.

PRIZES

1st Prize . . .	$100.00 Cash
2nd Prize . . .	75.00 Cash
3rd Prize . . .	50.00 Cash
4th Prize . . .	25.00 Cash
5th, 6th, 7th, 8th, 9th, and 10th Prizes—10.00 each in merchandise	

Brodhead-Garrett Co. is now serving thousands of schools with their famous "Soft-Texture" Kiln Dried Lumber and a complete line of Industrial Arts and Fine Arts Supplies necessary to equip fifteen separate departments in a school. For the meaning of "Soft-Texture" and the manner of kiln drying, see pages 18 and 19 of our Catalog No. 39—the largest and most complete catalog of its kind ever published.

It is the purpose of this contest to stimulate the further use of our lumber. The actual joy of accomplishment of the craftsman lies in using only the definitely fine Brodhead-Garrett Co. "Soft-Texture" KILN DRIED LUMBER.

JUDGES

ALLEN D. BACKUS
Director of Practical Arts Board of Education Newark, New Jersey

PROF. PAUL E. HARRISON
State Teachers College DeKalb, Illinois

DR. WILLIAM E. WARNER
Prof. of Education
Ohio State University Columbus, Ohio

BRODHEAD-GARRETT CO.

"Specializing in Soft-Texture Lumber and General School Supplies"

CLEVELAND - OHIO

(Continued from page 20A)

different projects which require a combination of wood and metal.

The designs were especially developed to combine artistic merit with usefulness, and the work is graded so that it fits both beginning and advanced students. The projects also were designed so as to require a minimum of equipment. The pages of the manual are printed on one side only so that they may be mounted for school use.

The sheets on "operations and processes" contain clear and concise directions on transferring designs, cutting sheets and rods, filing, piercing, drilling, riveting, bending, raising, annealing, soft soldering, chasing, hard soldering, and etching. These sheets also are well illustrated.

THE SOUTH BEND LATHE WORKS, South Bend, Ind., has recently published a new 48-page catalog, illustrating and describing their complete line of 9-in. workshop back-geared, screw-cutting lathes and attachments. A copy of Catalog No. 50 can be had free on request by writing to the company, attention of the Technical Service Department, and mentioning this magazine.

The lathes shown in this catalog are recommended for use in school shops and home workshops. Of special interest are the new quick-change-gear workshop lathes, which are introduced at prices much lower than the 9-in. quick-change-gear lathes previously offered.

Twenty-four different models of 9-in. Workshop Lathes are shown in this catalog. They include the Model A Lathes, with quick-change gear and power cross-feed; Model B Lathes, with power cross-feed and plain-change gear equipment, and the Model C Lathes, with hand cross-feed and plain-change gear equipment. Each of these different models is illustrated and described with horizontal motor drive, twelve-speed motor drive, V-belt motor drive, countershaft drive, underneath-belt motor drive, and pedestal motor drive.

BEHR-MANNING (DIVISION OF NORTON CO.) Troy, N. Y., has just issued a new wall chart of industry's metalworking abrasives as No. 6 in the series of releases comprising their educational program on coated abrasives.

This chart contains 12 sample chips of coated abrasive products as used in metalworking shops throughout the country today. These samples are complete with grit designations as well as brief statements concerning those operations for which they are best suited.

The dimensions of the chart are 14 by 18 in. This makes a most convenient size for display and inspection in classroom or workshop. All advertising references have been restricted to an absolute minimum on this chart.

Other units in this "Sandpaper" series are: (1) A lecture course on abrasives. (2) A 36 by 46-in. wall chart on manufacturing. (3) A set of physical samples containing five bottles. (4) A booklet on abrasive papers and cloths. (5) A wall chart of woodworking abrasives.

Anyone or all of the six units comprising this series may be had by writing to the Educational Service Department at the address given.

Visibility Yardstick

The A. B. Dick Co., 720 West Jackson Blvd., Chicago, Ill., has prepared a device called a visibility yardstick which enables one to measure the visibility of duplicated copies in direct relationship with printer's type. Thus it is possible to determine that certain duplicated copies equal the visibility of twelve- or fourteen-point Bodoni Book type, while other copies are as low in visibility as six-point type. With this device, schoolmen are able to choose text material that falls within the area of adequate visibility.

News Notes

♦ A new Committee on Rural Education with offices at 600 South Michigan Ave., Chicago, has recently been appointed by the American Country Life Association. This Committee is now fully organized under the following membership:

Roscoe Pulliam, Chairman, President of the State Teachers College, Carbondale, Ill.

Agnes Samuelson, Vice-Chairman, Secretary of the Iowa State Teachers Association, Des Moines.

Mabel Carney, Teachers College, Columbia University, New York.

Leo M. Favrot, General Education Board (retired), Baton Rouge, La.

Lowry Nelson, University of Minnesota, Minneapolis, Minn.

Floyd W. Reeves, Director National Youth Commission, Washington, D. C.

(Turn to page 27A)

THE MARKET PLACE

ELECTRIC CARVING POPULAR NEW CRAFT

KEEN INTEREST SHOWN IN CARVING PLASTICS

Students develop ingenuity, initiative and skill in this new art. Making giftware, toys, statuary, etc., with the high-speed MOTO-TOOL and Dremel Plastics is fascinating.

24 PAGE BOOK: "HOW TO MAKE 41 PROJECTS"

—same as in kits, sent separately, for only $1.00 Postpaid. Simplest manual of its kind . . . easy-to-follow - instructions. WRITE FOR SPECIAL DISCOUNTS ON QUANTITY ORDERS.

$1

MOTO-TOOL KITS

offer everything needed to master this new craft. Included is the precision Moto-Tool—useful in a thousand ways in shop and laboratory—for grinding, carving, sawing, polishing, drilling, sanding, and finishing. Also included are steel cutters, brushes, sanders, polishing wheels, etc., and plastic materials of various shapes and colors.

JUNIOR KIT—with No. 1 Moto-Tool (25,000 r.p.m.), 17 accessories, plastic materials for 10 projects, 24-page book "How to Make 41 Projects"—in beautiful wood case. List price, $17.85.

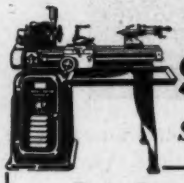
MASTER KIT—with factory type Moto-Tool (27,000 r.p.m.), 23 accessories, plastics for 20 projects, Book "How to Make 41 Projects"—all in wood case.

List price, $24.85

Write for complete information and special discounts to schools.

Kits are complete —nothing else to buy.

DREMEL MFG. CO., Dept. K-268-B, Racine, Wis.



SHELDON

Safety Underdrive

Back Geared, Screw Cutting PRECISION LATHES

For schools, no lathe equals a Sheldon 4-speed Type "U" Underneath Pedestal Drive. Full bowl headstock and cabinet leg enclose all belts and pulleys. Speed changes are made by external shift levers, and cabinet is opened only for occasional oiling.

Write for catalog showing complete line of 10, 11 and 12 inch SHELDON Precision Lathes.

SHELDON MACHINE CO. INC.
1625 N. Kilbourne Ave. Chicago, U.S.A.

QUALITY BOW AND ARROW KITS

Semi-finished Hickory Bowstave, flat type, 5½ ft. six Arrow shafts, points knurled on, nocked; six sets machine cut feathers; Bowstring; Handle cover, Postpaid $1.25. With Lemonwood Bowstave, $1.75.

Write for complete catalogue.

H. H. McCHESNEY
2414 Portland Ave. Minneapolis, Minn.

Our personnel staff has for many years been closely associated with the rapid progress which has occurred in industrial arts education, as well as in the more strictly vocational phases of education. Because of this fact, we are able to render effective service to teachers and administrators in their plans for securing better positions.

FISK TEACHERS AGENCY 28 East Jackson Blvd. Chicago, Illinois

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900 Plans

900 "TELUHOW" PLANS, DIRECTIONS
Inspiration for teachers. Many school projects.
Varied interests for all ages
Send 10c for list.

Chas. A. King **East Kingston, N. H.**

LOOMS, Table and Foot
Reed, Raphia, Handicraft Supplies

Send for catalog

J. L. HAMMETT CO.
CAMBRIDGE, MASS.

MASTER METAL BENDING TOOL

Makes Scrolls, Circles, Curves

For metal bending and wire forming. Accommodates metal up to 1 inch wide by ⅛ thick. Accurately adjustable by 1/16 inch. Widely used in school and craft shops. Obtainable at Hardware and Craft Supply Houses. Directions with each tool.

$2.75

Send for folder describing 25 Metal Projects and available Blue Prints.

LINDSLEY MFG. CO. DEPT. 5 BRIDGEPORT, CONN.

Get This **POWERFUL...MAN-SIZED LEMONWOOD BOW**

FOR THE SHOP

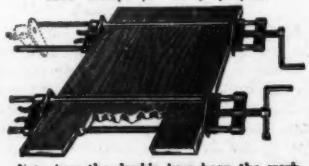
The L. C. Whiffen Company has specialized in archery materials for years. We have a thorough understanding of its problems. Our supplies are used in shop work all over the country. Our high standard of quality is nationally recognized. Our prices leave others guessing. Write for illustrated catalogue.

L. C. WHIFFEN CO., Inc.
828 W. Clybourn St. Milwaukee, Wis.

HARTFORD CLAMPS

Hartford Single and Double Bar, Self-Locking and Unlocking Clamps have been standard in most schools for over fifteen years.

Write for free catalog covering hand clamps for every purpose.



Note how the double bars keep the work from buckling.

HARTFORD CLAMP CO.
Burnside Connecticut

ELECTRO-TYPERS

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

ARMSTRONG
Tool Holders

The ARMSTRONG System provides permanent multi-purpose tool holders for every operation on lathes, planers, slotters and shapers. Each takes cutters quickly ground from standard high speed steel shapes. Each effectively equals a complete set of forged tools and "Saves All Forging, 70% Grinding and 90% High Speed Steel."

Write for free Cutter Bit Grinding Charts

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
322 N. Francisco Ave. Chicago, U.S.A.

ELECTRIC
MOTOR PARTS
FOR ALL MAKES

ALSO ALL MATERIALS AND TOOLS USED IN THE MOTOR REPAIR SHOP
Free Catalogue to Instructors

READING ELECTRIC CO., Inc.
200 William St. New York
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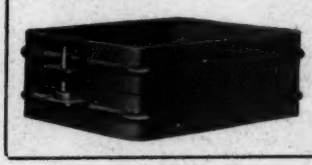

STERLING STEEL FLASKS

Made of Specially Rolled Copper Bearing Rust-Resisting Steel Channel sections having a solid center Rib and Solid Sand Flanges at Top and Bottom.

Write for Catalog of Flasks and Other Foundry Equipment

STERLING WHEELBARROW CO., Milwaukee, Wis.

DO THE JOB RIGHT

STOP **Investigate the ADVANTAGES OF SPEED-LINE**

SPEED-LINE Stereotype equipment is practical equipment, the kind found in progressive print shops throughout the country.

Casting boxes from	$27.50
Matrix moulders	45.00
Scorcher	20.00
Mat Humidor	14.50
Saw (not shown)....	39.50
Router (not shown)	47.50

STEREOTYPE EQUIPMENT IN SCHOOL PRINT SHOPS

NOLAN MACHINERY CORPORATION
ROME, N. Y.

CORNER ROUNDER
SHEAR-ACTION SELF-SHARPENING

Model No. 20
$15

Over five thousand in use by printers, schools and libraries. Round-cornering will prolong useful life of visible or looseleaf records, catalogs,, letterheads, etc. Easy to operate! No guide adjustments or tools needed. Instantly interchangeable dies. Price includes one die: ⅛", ¼", ⅜" or ½" radius; extra dies $5 each. Shipping Wt. 5 lbs. Send for 10 day trial —or folder V140.

LASSCO PRODUCTS, Incorporated
485-495 Hague Street
Rochester, N. Y.

½ inch at a stroke

Now... your students can make rustic furnishings

RUSTIC CONSTRUCTION

By W. Ben. Hunt

With the material literally lying around almost everywhere waiting to be used, your shop can introduce the construction of rustic furniture, bridges, stairs, swings, fences, etc., described in this book. All the articles are inexpensive, durable, and easy to make, and will fit in perfectly with any surroundings.

Cloth, $1.00; paper, 50 cents

THE BRUCE PUBLISHING COMPANY
702 Montgomery Building Milwaukee, Wis.

(Continued from page 19A)

industries with special relation to labor organizations. State Director James R. Eddy and Editor W. B. Arnold *Weekly Dispatch*, led these discussions.

A. C. Lloyd, electrical engineer, contributed a paper on, "Vocational Education and the Advisory Committee."

During his discussion of the educational problems of South America on the main convention program, Dr. Ernesto Galarza, Pan American Union, Washington, reported a marked change in the type of secondary school in South America from a curriculum almost wholly devoted to formal preparation for college to one in which vocational subjects were being rapidly introduced.

The new officers for the several sections are: Vocational-education section: President, M. C. Stone, North Texas Agricultural College, Arlington; Vice-President, W. B. Baron, San Antonio.

Industrial-arts section: President, H. K. Dodgen, Junior College, Temple; First Vice-President, Wayne Adams, North Texas State Teachers College, Denton; Second Vice-President and Secretary, C. L. Jones, Bickler, Opportunity School, Austin.

Trades and industries section: President, Charles A. Johnson, Houston. — *Victor J. Smith.*

♦ Fifty-eight members of the Industrial Education Teachers Club of the Southern Zone met for their first dinner meeting of the year on Friday evening, December 8, 1939, at the Green Lantern Inn, Owego, N. Y.

The dinner was high lighted by between-course group singing ably led by Ronald Johnston, with Harold Wilson at the piano.

President Carlton Dwight opened the program by calling on William J. Becker, club representative on the state steering committee, for a report. The club voted to cooperate with the steering committee in their publications plan.

The program of the evening concerned teaching methods and techniques. The following club members participated in the discussion:

Russell Norris, Endicott — Job record sheet.

N. A. McMillan, Elmira — Devices for checking progress.

Kenneth Parker, Hancock — Shop records.

E. J. Woodams, Ithaca — Shop-made electric kiln and potter's wheel for general shops.

Carlton Dwight, Binghamton — Vitalizing the pupil-personnel organization.

In addition to a speaker at the next meeting, club members will participate by presenting unusual teaching aids they have developed or by discussing their hobbies. — *Lee H. Kent,* Secretary.

New Publications

Miscellaneous Books

Among the books received which may be of interest to school-shop instructors are the following:

The Strategy of Job Finding

By Lyons and Martin. Cloth, 408 pages, 6½ by 9⅜. Price, $4. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York City.

Better Business Letters

By L. E. Frailey. Cloth, 198 pages, 5⅞ by 8½. Price, $2. Published by American Technical Society, Chicago, Ill.

Seeing Our Country

By Walter B. Pitkin and Harold F. Hughes. Cloth, 384 pages, 6½ by 9½, illustrated. Price, $1.60. Published by The Macmillan Co., 60 Fifth Ave., New York City.

Exploring in Physics

By Reginald J. Stephenson. Paper, 205 pages, 6¾ by 9¼, illustrated. Price, $1.50. Published by The University of Chicago Press, Chicago, Ill.

The Story of Man's Quest for Water

By Jasper D. Draffin. Cloth, 232 pages, 5½ by 8⅜, illustrated. Price, $2.25. Published by The Garrard Press, Champaign, Ill.

The Knack of Selling Yourself

By James T. Mangan. Cloth, 234 pages, 5¾ by 8¼. Price, $2.50. Published by The Dartnell Corporation, 4660 Ravenswood Ave., Chicago, Ill.

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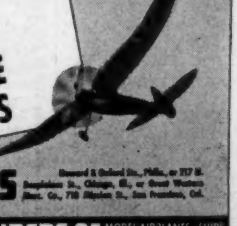

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Mrs. Raymond Sayre, State Farm Bureau, Ackworth, Iowa.

Maurice F. Seay, University of Kentucky, Lexington.

J. F. Waddell, State Department of Education, Madison, Wis.

Miss Iman E. Schatzmann, formerly educational investigator for the International Bureau of Education and research assistant for the International Institute of Agriculture, Rome, has been appointed Executive Secretary.

♦ The Beaux Arts Institute of Design, 304 East 44th St., New York City, announces a competition for the design of a building in which to house a 1000-watt radio broadcasting transmitter. This competition is sponsored by the Western Electric Co. in order to stimulate interest in the design of specialized structures for radio broadcasting equipment.

Three prizes — $250, $100, and $50 are offered with the hope that the best undergraduate talent may be tempted to enter the contest.

The competition opens January 8 and closes May 1, 1940.

♦ About 75 adults, residents of Lancaster County, Pa., may be found on the Millersville, Pa., State Teachers College campus every Tuesday night working in metals, alloys, plastics, wood, or paper. Many bring antiques to be repaired or refinished. Others bring valuable wood cut from their own wood lot or perhaps other salvage materials.

These groups engage in the following activities: bookbinding, etching, linoleum block cutting, type composition, architectural planning and designing, introductory mechanical drawing, sheet-metal pattern drafting, wood finishing and refinishing, woodwork, and the various metalworking activities.

Each activity group is in charge of an industrial-arts senior who is pursuing the industrial-arts teacher-education course on the Millersville campus. Other industrial-arts seniors serve in capacity of assistants. The Millersville industrial-arts staff members supervise these adult activities. About as many women as men are enrolled.

A project of special interest this term is the binding of Braille books by three American Red Cross workers.

♦ Nonprinter layout men have been the motivating influence in improving typography! A layout man necessarily does not have to know production! Dynamic symmetry has gone by the board! A layout does not have to be balanced! These, and many other statements caused a great deal of discussion at the typographic meetings held in Rochester at Mechanics Institute's printing department and the Rochester Club of Printing House Craftsmen on September 18.

♦ A trade extension course in the fundamentals of metallurgy has been established in the senior high school at Anderson, Ind. The course which is sponsored by the local school, will be conducted in the evening. It will be limited to 30 students and will be open only to machinists and toolmakers engaged in metallurgical work.

♦ Air Youth of America, 30 Rockefeller Plaza, New York City, Ernest Gamache, executive director, has been formed to stimulate interest in aviation by offering guidance and expert assistance to groups engaged in building and flying model planes.

Among the services offered is a monthly bulletin, four or five scientifically graded kits, plans and specifications for advanced model builders, an instructor's manual, and a contest handbook.

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♦ Trade courses offering a wide variety of subject material have been inaugurated in the Hackley Manual Training School at Muskegon, Mich. More than 50 have enrolled in the night-school program sponsored by the board of education.

♦ A farm-mechanics course and an adult evening course in agriculture have been introduced in the high school at Hudson, Mass.

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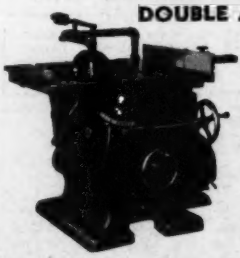

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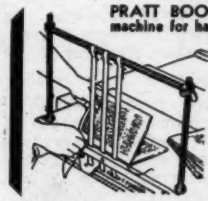

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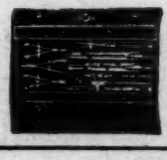

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